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ABSTRACT

This document provides administrative, management, supervisory guidance, and other information necessary to successfully conduct and support science symposia for grades 7-12. This text was originally developed by the Pacific Region Junior Science and Humanities Symposium program for participating schools and school districts in the Department of Defense Dependent Schools Pacific Area. This guide is appropriate for use by secondary administrators, coordinators, mentors, and students and contains project writing guidelines, program application forms, abstract forms, sample research paper abstracts, and other research project-oriented information. (DDR)

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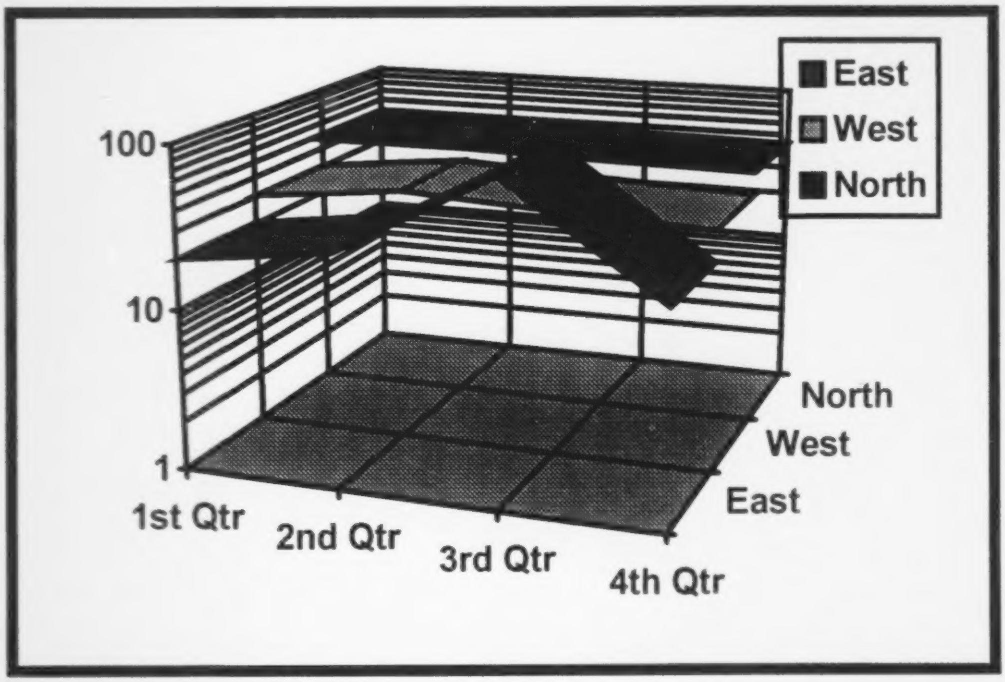

Management and Operation of the Pacific Region Junior Science & Humanities Symposium

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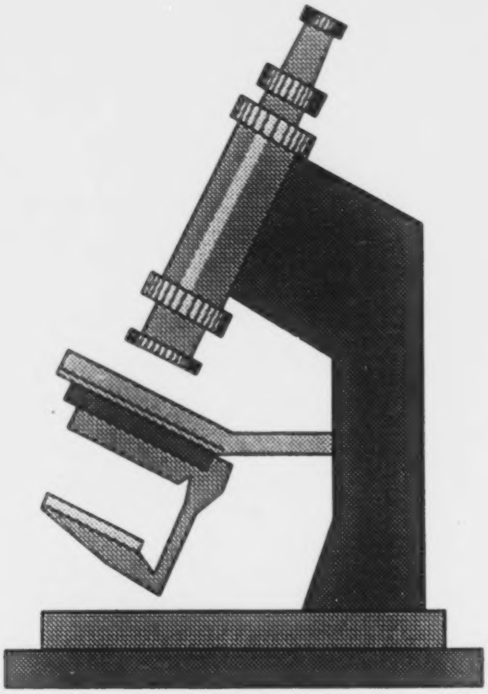
Conducting Science Symposia From α To ω
Management and Operation Of The Pacific Region Junior Science and Humanities Symposium



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CHAPTER ONE
PURPOSE

***Conducting Science Symposia from α to ω* Management And Operation Of The Pacific Region Junior Science and Humanities Symposium** provides administrative, management, and supervisory guidance and other information necessary to successfully conduct and support grades 7-12 science symposia. Orginally, the text was developed as the operations manual for the Pacific Region Junior Science and Humanities Symposium [PJSHS]. Its major purpose today remains to serve that end. As such, it contains the information necessary to administer the Pacific Region Junior Science and Humanities Symposium program in the participating schools, and school districts of the Department of Defense Dependent Schools Pacific Area.

REVISIONS. The text is revised periodically to meet changing PJSHS needs, evolving National Junior Science and Humanities Symposium policy, regional program funding requirements, and changing school management practices. Initiation of publication changes, updates, and irratas are the primary responsibility of Pacific Region JSHS Director. The JSHS Regional Director is appointed with the advice and consent of the regional support institution [Department of Defense Dependents Schools in the case of the Pacific Symposium region], by the Director, National Junior Science and Humanities Symposium, Academy of Applied Sciences, 98 Washington St., Concord, New Hampshire 03301.

When revised, new editions of the text are published in December of the year by the District Superintendent of Schools, Department of Defense Dependents Schools, DoD Dependents Schools Japan, Unit 5072, APO AP 96328-5072. When first published in 1988, the text was revised annually, and each edition overlapped the previous edition, covering a period from January of one year to July of the following year. The Pacific Region JSHS still operates the yearly program within that time frame.

USES. This document, and its antecedents, were prepared for use by high school and middle school administrators, participating schools based JSHS coordinators, participating schools based JSHS sponsors, JSHS mentors, participating school district superintendents. The text should be used by students, as well, when they write research proposals, conduct research projects, write research reports, and track deadlines as part of the Pacific Region JSHS program. Also included here are project writing guidelines, program application forms, abstract forms, example research paper abstracts, and other research project oriented information.

CHAPTER TWO
ADVISORY BOARD

Each of the forty-seven regional symposia of the National Junior Science and Humanities Symposium include advisory boards. The advisory boards are composed of industrial leaders, business community leaders, government employees, parents, precollege and university administrators and teachers, and others interested in the advancement of science research among precollege students. Advisory Board members are volunteers. All members are stake holders in the future success of our nation's youth to make correct evidence based decisions to solve societies perplexing dilemmas. The purposes, membership, and membership selection procedures for the JSHS Pacific Region Advisory Board are:

PURPOSES: The purposes of the advisory board are:

- To provide advice to the Symposium Regional Director regarding matters related to the functioning of the Symposium.
- To serve as a Symposium design standing committee.

MEMBERSHIP: The members of the committee are as follows:

- One parent of a grade 9-12 student.
- One parent of a grade 7-8 student.
- At least one school level administrator.
- At least one Department of Defense Dependents Schools Pacific Area, District Superintendent of Schools
- One member from the U. S. Army Research Office, Japan.
- One member from the U. S. Navy
- One Member from the U. S. Air Force.
- One grades 9-12 science teacher.
- One grades 7-8 science teacher.
- The Pacific Region JSHS Director serves as an ex officio member of the board.
- A school district representative from each district participating in the program.
- One grade twelve student who has completed at least one year of participation in the Junior Science and Humanities Symposium.

SELECTION OF ADVISORY BOARD MEMBERS:

- *Army, Navy, & Air Force*. A request is made to the member's Commander six months before the end of the members term of office to assign a new member to the Advisory Board.

- *Parents*. Applications are solicited from parents as soon as there is an announced vacancy on the board. An ad hoc committee of educators from the Department of Defense Dependents Schools Japan District, makes the final selection.

- *Student*. By recommendation of teachers. A student serves only one year. An ad hoc committee makes the final selection

- *School District Representative*. School district representatives are appointed by the district superintendent of schools.

- *School Administrators*. School administrators submit applications and the final selection is made by an ad hoc committee.

- *Teachers*. Teachers submit applications and the final selection is made by an ad hoc committee.

TERMS OF OFFICE: Two years with the option of two one year extensions, except for student members. They serves for one year.

BOARD MEETINGS: An annual Advisory Board meeting is normally held in the spring of the school year after the conclusion of the annual Pacific Region Symposium.

CHAPTER THREE
PROGRAM OVERVIEW

SYMPOSIUM REGIONAL DIRECTOR: An employee of the Department of Defense Dependents Schools Pacific Area.

SYMPOSIUM ASSISTANT DIRECTOR: A member of the District Superintendent of Schools, Japan staff.

SYMPOSIUM HOST: Department of Defense Dependents Schools, District Superintendent of Schools, Japan

ACTIVITY DESCRIPTION: The Pacific Region JSHS is a calendar year precollege student research program. The program includes a one week symposium of students [grades 8-12] who have completed a research project in any of the sciences or have developed a science research proposal. Students who attend the Symposium present research findings, and research proposals to Symposium participants; visit research laboratories and; attend guest lectures in which research and its importance to the future of human-kind are discussed. The importance of humane conduct of scientific research and humane application of research results are stressed.

LOCATION: Tsukuba Science City, Japan

TRANSPORTATION ARRANGEMENTS: Arrangements for participant travel to and from the Symposium are made by school administrators, and school district superintendents of schools.

STUDENT PARTICIPANTS: All grades 7-12 students enrolled Department of Defense Dependent Schools Pacific Region Schools are eligible to participate. Grade seven students, however, conduct all of their program related activities at their home schools and in their home school districts.

NUMBER OF PARTICIPANTS: 150. There is no limit to the number of students who can participate from an individual school or school district.

SYMPOSIUM MEETING DATES: Annually in late March and early April.

PROGRAM FUNDING: The Symposium operates under a grant from the Academy of Applied Sciences, Concord, NH, the Army Research Office, Research Triangle Park, Raleigh, NC, the U.S. Naval Research Office, and the U.S. Air Force Research Office. Additional funds are provided by the Department of Defense Dependents Schools Pacific Area.

- **ATTENDING FACULTY**: All expenses are borne by the Symposium. Transportation to the Symposium and substitute teacher expenses are paid by the Department of Defense

Dependents Schools Pacific Area.

- **PARTICIPATING STUDENTS:** All Symposium expenses are borne by the Symposium. The only cost to students is a $40.00 non-refundable application fee. Transportation expenses for travel to the Symposium are paid by Department of Defense Dependents Schools Pacific Area.

PARTICIPANT SELECTION PROCESS: Eligiblity to attend the Tsukuba City, Japan portion of the Symposium program is determined as follows. A student must: [1] submit an application form postmarked not later than December 15 of the Symposium year; [2] submit an acceptable science research paper reporting research results postmarked not later than January 15, of the Symposium year, or; [3] submit an acceptable research proposal by 15 January. **The mentor of each student researcher decides whether his or her student has conducted a research project of sufficient quality to warrant having the student researcher attend the Symposium**. Research proposals are evaluated by school personnel and the authors of acceptable proposals are subsequently invited to attend the meeting. In years when the number of Symposium applicants exceeds the available lodging space, a pro rata formula based upon school district grades 8-12 population is instituted to further select students who be invited to attend. That process is described completely in later paragraphs of this document.

SYMPOSIUM OBJECTIVES: The objectives of the Symposium Program are to:

- **PROMOTE** research and experimentation in the sciences, mathematics, and engineering at the grades 7-12 level.
- **RECOGNIZE** the significance of research in human affairs, and the importance of humane and ethical principles in the application of research results.
- **IDENTIFY** talented youth and their teachers, **RECOGNIZE** their accomplishments at symposia and **ENCOURAGE** their continued interest and participation in the sciences, mathematics, and engineering.
- **EXPAND** the horizons of research-oriented students by exposing them to opportunities in the academic, industrial, and governmental communities.
- **INCREASE** the number of future adults capable of conducting research.

CHAPTER FOUR
PROGRAM DESCRIPTION

A new Junior Science and Humanities Symposium program begins each year on January first. The program subsequently continues for approximately seventeen months. Students who enter the program are invited to conduct original science research. The research period ends January 15 of the next school year. At the conclusion of the research period, students, who have completed research projects and have written research project papers, or have written acceptable research proposals, are invited to attend the Symposium. During the Symposium student participants present the results of their research to other students, visit Japanese science research institutes, participate in Japanese-American cultural events, and participate in other science and cultural activities.

A substantial period during the Symposium is dedicated to formal student presentations of completed research. Three top regional student researchers are identified as a result of the formal presentation process. In late April or early May, the three top student researchers travel to the United States where they attend the National Junior Science and Humanities Symposium.

The National Junior Science and Humanities Symposium is a forum where students researchers are able to share their research with others. Here, the top regional student researcher [from the Pacific Area] presents his or her research findings to student researchers of other JSHS regions in the United States and Europe. Students who present papers at the National Symposium compete with fellow presenters for an opportunity to attend the International Youth Science Forum. The Forum, held in London, UK, during the following summer, is a gathering of student science researchers from as many as 50 nations around the globe.

The top research student from the Pacific Area is awarded a college scholarship by the U. S. Army Research Office and a chance to compete for a scholarship at the National Symposium. Occasionally scholarships, donated by industry, are also awarded to the second and third place researchers.

CHAPTER FIVE
GRADE EIGHT RESEARCH PROGRAM

The Grade Eight Research Program is open to all eighth grade students enrolled in Pacific Area Department of Defense Dependents Schools. The program helps students get started in science research if they have not previously conducted research. For students who have participated in the Seventh Grade Science Research Feeder Program, the intent is to sharpen research skills they acquired there. The program functions as follows:

PARTICIPANTS: While not mandatory, we suggest schools attempt to involve equal numbers of male and female students in research at the grade eight level.

GRADE EIGHT STUDENT SYMPOSIUM ATTENDANCE: Schools should use the following factors to identify grade eight students who will attend the symposium:

- the quality of the research conducted by a potential participant.

- the quality of the research paper written by a potential student participant. **Students are selected to participate by the schools**.

- the actual selection process used to identify students who will participate is determined by school personnel. Whatever selection process is used, grade eight attendees must have completed a research project, and submitted a paper reporting the results of that research [**library research projects are not acceptable**].

PARTICIPANT ELIGIBILITY: To be eligible for participation in the Symposium, grade eight students must complete a research project and write a science research paper. Project standards of excellence described for high school students apply to grade eight students as well.

SYMPOSIUM ACTIVITIES: Grade eight students who attend the Symposium: [a] participate in poster sessions; [b] participate in formal eighth grade presentation sessions; [c] participate in a research seminar; [d] attend field trips, and; [e] participate in cultural activities.

GRADE EIGHT SYMPOSIUM SPONSORSHIP: One middle school sponsor attends the Symposium for ten students the school sends to the Symposium. A school that sends eleven student participants, sends two sponsors. In grades 7-12 schools, grade 8 students accompany the JSHS school sponsor [see the chapter which discusses Symposium sponsors].

CHAPTER SIX

RESEARCH PROPOSAL PROGRAM

The research proposal program is open to all grade nine and ten students. To be eligible for participation under this section of the program, a student must do all of the preliminary research work, and subsequently write a completed research proposal acceptable to his or her mentor. Selections of the research proposal students to attend the Symposium is made at the high schools by mentors, and other science teaching personnel. Research proposals must be written in the format provided in the Research Proposal Format section included below. Students who attend the Symposium under the provisions of this chapter are expected to participate in a poster session. Their posters should describe the contents of their proposals. Participating students must submit a copy of their completed proposal by 15 January to the same location as do the students submitting completed research papers. All other application rules, deadlines, and writing guidance included in other sections of this document apply to students who wish to submit research proposals.

RESEARCH PROPOSAL FORMAT AND WRITING GUIDANCE

INTRODUCTION

Each year, high school students across the United States conduct science research projects as part of high school science fairs, and large research programs like the Junior Science and Humanities Symposium and the Westinghouse Talent Search. Each high school in the Department of Defense Dependents Schools Pacific Area participates annually in the National Junior Science and Humanities Symposium Program. To be part of the Symposium program, student participants must conduct a science research projects and write research reports, or complete science research proposals and the associated writing. They must also present the results of their research work to other student researchers.

Science research has at least two goals. First, researchers attempt to replicate studies previously conducted by other researchers. Their intent is to determine whether identical or nearly identical results can be obtained when a study is conducted again. Additional research results, if they are similar to the original results, support the original findings. When trends like this appear theories develop. A theory predicts the outcome of events prior to their occurrences. We must remember, however, that generally scientists theorize only after a large body of similar experimental results has been amassed.

A second goal of the research community is to answer questions by conducting original research. Original research provides us with new understandings of phenomena under investigation.

Symposium researchers are encouraged to pursue original research. Getting started, however, is not easy. When students begin their research, they frequently fail to employ the systematic techniques and procedures used in the research community. This failure often leads to research results and subsequent interpretations that are flawed.

How can such flaws be avoided? Some shortcomings are avoided when beginning student researchers develop research proposals and ask fellow students to critique the proposals prior to beginning the data collection phase of a research project.

Research proposals serve a number of purposes in the scientific community. They are used by investigators when project support is sought from funding agencies like the National Science Foundation. Proposals are also used by college researchers when proposed projects are to be scrutinized, for problems, by their colleagues.

There are many proposal forms. The one used depends upon the group who must pass judgment on the worth of the proposed research. In the following paragraphs, a form especially useful to beginning high school researchers is discussed. This model includes the following sections: Title Page; Introduction; Hypothesis or Research Question; Research Design; Literature Cited.

PRESENTATION

In research, many events occur prior to data collection. First, observations of the environment are made. Observations lead to identification of problems or recognition of events which seem out of place or odd under prevailing circumstances.

The second task is the conduct of a literature search to learn more about observed events. Literature searches help investigators learn what is known about apparent problems, and provide the background needed to conduct subsequent research. A literature search often drives later research design. Information obtained during searches helps to identify possible problem related cause-effect relationships, thereby aiding formulation of hypotheses or research questions. Literature searches also help identify variables requiring control when project data are collected. Literature search information is indispensable when research designs are developed. Finally, literature searches are conducted prior to writing research proposals and become an integrated part of a proposal.

Once written, research proposals are circulated to colleagues for comment. Student colleagues are asked to read the proposal, comment upon project completeness, and make suggestions for project improvement. The major intent of the research proposal sequence is to help student researchers identify project problems, like the failure to control a particular variable, early in a research project. If problems are corrected early, the strength of the research proposal is increased. Once written, a research proposal becomes a major portion of a student's final research report. Let's look at our research proposal format.

THE RESEARCH PROPOSAL FORMAT

Title Page. The research proposal title page includes the research project title, the researcher's name and the name of the school where the researcher is a student. The project title is the first thing readers see. It should describe the project as completely, accurately, and succinctly as possible. It must convey the message that the proposal contains something significant. The title becomes the title of the final research report. The title also becomes part of the research report "Abstract" when the report in finally written.

Introduction. A research proposal **Introduction** section includes a statement of the research problem, and an historical overview of the research problem. The history is a brief report of the problem as it is described by other researchers in journals, textbooks, unpublished research reports, personal conversations, and so one. Research project rationale is also included in the introduction section. Research project rationale is the reason why the project is to be conducted. Authors of literature, used to present the historical overview of the problem and project rationale, is cited in this section. When cited, standard literature citing procedures [Schlenker, 1989, 1991; Schlenker, Yoshida, and Key, 1994; Day, 1994] are used. Documents cited here are also listed in a, "Literature Cited," section at the end of the proposal.

The problem history and researcher observations of the environment are used to draft the project rationale. Once completed, this section of the proposal, with the inclusion of hypotheses or research questions, becomes the "Introduction" section of the final research report. Moreover, information from this section may also be included in the "Abstract" of the final report.

Hypotheses Or Research Question Section. This section contains the hypotheses to be tested or the research questions to be answered when research project data are analyzed. Both hypotheses and research questions are mentioned. Both are used by researchers. When a researcher formulates an hypothesis, it is appropriate to include the level of statistical significance used to accept or reject the hypothesis [for example, a hypothesis will be accepted or rejected at $p > 0.001$]. Much of the information in this proposal section is incorporated in the, "Abstract, Introduction", and "Discussion" sections of the final research project report.

Research Design Section. Here, a researcher describes his or her experimental design used for gathering data. The procedures and materials to be used when data are collected are included in the design. The design is described in writing and may be supported by figures. It should be described in sufficient detail so that someone other than the proposal writer could conduct the study. An example research design is shown in Figure 1. In the design, factors: "A" and "a" might represent sexes; "B" and "b" might represent litter sizes of say less than four and greater than four; "C" and "ç" might represent maternal age at birth like greater than three years and maternal age at birth less than three years; "X" and "x" might represent all juveniles having the same father and all juveniles that do not have the same father; "Y" and "y" might represent all juveniles with the same mother and all juveniles that do not have the same mother; "Z" and "z" might represent juveniles raised on a high protein diet and juveniles raised a low protein diet.

Other factors that have the potential to alter project outcomes, like the control of environmental temperature and humidity, should be discussed in this section. A description of how the variables or factors are to be controlled should be included also.

	ABC	ABc	Abc	abc
XYZ	ABC XYZ	ABc XYZ	Abc XYZ	abc XYZ
XYz	ABC XYz	ABc XYz	Abc XYz	abc XYz
Xyz	ABC Xyz	ABc Xyz	Abc Xyx	abc Xyz
xyz	ABC xyz	ABc xyz	Abc xyz	abc xyz

Figure 1. An Example 3 x 3 Factorial Design Showing The Manipulation Of Variables To Produce Various Experimental Combinations.

Equipment used in the investigation is also listed in this section. When equipment is used, as described by manufacturers, further operational descriptions are not necessary. A detailed description of how a Nansen bottle is lowered to a depth of ten meters below the seawater surface, tripped, and returned to the surface with its water sample, is not needed because the manufacturer's guidelines are being followed. Conversely, if the equipment is to be used in an atypical manner, the way in which it will be employed must be described. If a string of Nansen bottles, for example, is suspended at an angle of 45 degrees from the surface platform and not tripped until a specific dinoflagellate population reaches a certain population density per cubic centimeter of seawater, then the details of the bottles' use must be described. This procedure is not considered normal use.

Once a research project has been completed, this section, with changes made during the data collection phase of the research project, becomes a large part of the "Methods and Materials" section of the research project report.

Literature Cited Section. All literature cited in the context of the of the research proposal is listed here. Standard citation procedures are used. Information obtained from the internet is also cited. A research paper style guide should be checked to obtain the proper method used to include such sources. Papers and other publications are listed alphabetically by the author's last name. If a document is not cited in the context of the proposal, it is not listed here even though the [student] investigator may have referred to the document when writing the proposal. This section becomes the "Literature Cited" section of the final research report.

SUMMARY

Research proposals are integrated parts of research projects. They are drafted prior to beginning the data collection phase of a project and are intended to identify project shortfalls before data are collected. Such proposals help investigators conduct more highly controlled projects than is otherwise possible. Research proposals allow project design changes and corrections to be made before research is conducted based upon the input of unbiased colleagues. Large portions of research proposals become parts of final research reports.

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CHAPTER SEVEN

GRADE SEVEN SCIENCE RESEARCH FEEDER PROGRAM

The Grade Seven Science Research Feeder Program is intended to help students get started conducting research. There are major similarities and differences between this program and the grades eight through twelve program. Grade seven program participants conduct research like the grades eight through twelve students who participate. Grade seven students, however, do not take part in the Tsukuba City, Japan portion of the program. Presentation of grade seven research is done at the school attended by the student. Grade seven presentations are made in a manner decided upon by the school science department. A recommended format for a grade seven science symposium is provided below. The program participation requirements are also decided upon by the local schools.

PROGRAM REQUIREMENTS:

ELIGIBILITY. All grade seven students in the Department of Defense Dependents Schools Pacific Area are eligible to participate.

PROGRAM CONDUCT. We recommend that this program be conducted on a school year basis, rather than the annual year basis used with the grades eight through twelve program. The school year approach allows teachers to have entire classes participate in the program, and to conduct research as part of their regular science class activities.

PROGRAM REQUIREMENTS. The minimum requirements for a grade seven program to be sanctioned for participation in the Pacific Region Junior Science and Humanities Symposium are listed below. Additional requirements like students having to acquire project approval prior to beginning a research project may be added to meet the needs of individual teachers and schools.

- Each participating student must conduct a science research investigation as defined in other chapters of this text for grades eight through twelve students.

- Each participating student must write a research report to the same standards as listed in other sections of this text for grades eight through twelve students.

- Each research paper must be completed on a wordprocessor, and contain all sections that are expected required in the reports of grades eight through twelve students.

APPLICATION FEE. There are no application fees required for participation in the grade seven program.

AWARDS. The Pacific Region Junior Science and Humanities Symposium will provide some type some type of book (dictionary, thesaurus, or research text) to be used as an award based upon the following formula. Additional awards may be provided by the participating schools.

- To receive a single text, a school must have at least five students participate in and complete a symposium research project.
- To receive two texts, a school must have between thirty-one and sixty students participate in and complete symposium research projects.
- An additional book will be provided for each additional thirty students who conduct and complete a research project. A school that has 120 students complete research projects will receive four books, whereas a school having 125 students complete research projects will receive five books.
- To receive the awards, a school must submit copies of the research paper abstracts to the Pacific Region Junior Science and Humanities Symposium Director. Copies of the abstracts must be received by the Pacific Region Junior Science and Humanities Symposium Director not later that April 15 of each school year. Each abstract submitted must be on the abstract form included under the discussion of abstracts in this text. Abstracts not submitted on the form, or not written according to the criteria for abstract writing may be rejected.

CONDUCT OF GRADE SEVEN SYMPOSIUM PRESENTATIONS. A list of recommendations is provided below. Completion of a scientific investigation by a seventh grade student is a major accomplishment. We recommend it be treated that way by recognizing the successful student's accomplishments in both the school and the community.

- A grade seven symposium could be divided into a poster session and formal presentation session. The school auditorium could be used for formal presentations while the school halls could be used for poster presentations. Since this is not a science fair, there is no need for the use of tables. Posters may be taped temporarily to the walls.
- The symposium presentations could be made in the late afternoon or early evening so that parents can attend.
- The same size restrictions should be used for grade seven posters as are used on grades eight through twelve posters.
- Selections of students to make formal presentations is decided

by school science department members.

- Students who make formal presentations should be allowed as much time for their presentations as grade eight students are allowed.
- Judges for formal presentations should be drawn from science department of other schools, community members and so on.

NOTES

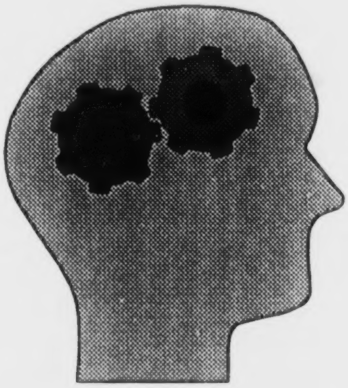
CHAPTER EIGHT
JAPAN DISTRICT RESEARCH SEMINAR

Each school year the Superintendent of Schools, Japan District Department of Defense Dependents Schools, Pacific Area conducts a research seminar program as part of the JSHS program. The seminar is usually conducted in Tokyo, and at Misawa Air Base in northern Japan. This program brings teachers, students and scientists together at the two locations. The seminar is intended to help students identify areas of interest, and to help students learn the steps of the research process. During the seminar students brainstorm about research topics, attempt to identify topics suitable for grades eight through twelve research, discuss criteria for selection and use of statistics with various types of research and more.

The program is conducted by personnel from the Japan School District. Costs of facilities rentals are paid by the Pacific Region Junior Science and Humanities Symposium.

TOKYO SEMINAR: The Tokyo seminar is held twice each school year, usually at the New Sanno Hotel and is attended by students from Zama High School, Kinnick High School, Yokota High School. The seminar includes two full day meetings. The first meeting is normally held in the spring after the Pacific Region JSHS. The second meeting is held in the fall shortly after the beginning of the new school year. Generally, the same students attend both meetings. The number of students who attend from each Kanto Plain High School is determined by Japan District Superintendent of Schools.

MISAWA AIR BASE SEMINAR: This seminar is normally held once each school year, and may be either in the fall or the spring. Again, the number of students who attend is set by Japan school district personnel.



CHAPTER NINE
SCHOOL DISTRICT SYMPOSIA

Four school districts participate in the Pacific Region Junior Science and Humanities Symposium. They the Department of Defense Education Activity school districts of Okinawa, Korea, Guam and; Japan. The schools of these districts send students each year to the regional symposium in Tsukuba City, Japan. As a method of increasing the number of students who conduct research, some school districts hold their own symposium. When this procedure is followed, the district symposium is used as a stepping stone to the regional symposium. Since only a limited number of students can attend the regional symposium, students accepted for participation in district symposia also experience success even though their research work was deemed not of sufficient quality for them to be invited to the regional symposium.

OBJECTIVES. The objectives of school district symposia are to:

- Provide increased opportunities for students to present the result of their research to other students and the community at large.
- Provide as many research students as possible with a mark of accomplishment even though some might not be selected for participation in the regional symposium.
- Increase the number of students who conduct research and have completed a research project.
- Provide an objective method by which students are selected to attend the regional symposium.

ELIGIBILITY. All grades eight through twelve students are eligible to attend district symposia, subject to the availability school district resources and program design.

TIME. The district symposia are held at a time selected by the individual district superintendents of schools. They are conducted early enough in the school year so that students can submit their papers and be considered for regional competition by January 15 of the school year.

LOCATION. Locations of district symposia are determined by the individual district superintendents of schools.

LENGTH. Lengths of the district symposia are determined by the district superintendents of schools.

FORMAT. The format of the district symposia is determined by the district superintendents of schools. One format would have all students participate in poster sessions conducted like poster sessions at the regional symposium. Students informal presentations would be judged according to this format, the students subsequently rank ordered, and students whose scores placed them above the cutoff number [the number of spaces allotted for the district at the regional symposium] selected to attend the regional symposium.

QUESTIONS. Questions regarding district symposia should directed to the respective district superintendents of schools.

NOTES

CHAPTER TEN
SYMPOSIUM FACT SHEET

PURPOSE: The pupose of the fact sheet attached to this chapter is advertising. It should be used to inform parents, students and community regarding the general aspects of the Pacific Region Junior Science and Humanities Symposium. It can obtained from the computer file of this document stored on the Junior Science and Humanities Symposium computer disk supplied to each school. The file name is WP04507.DOC.

NOTES

Fact Sheet
Pacific Region
Junior Science and Humanities Symposium

What: The Junior Science and Humanities Symposium Program is a grades 8-12 science research program. The Pacific Region is one of 47 National Junior Science and Humanities Symposium regions located throughout the United States, Europe and the Pacific. The program has been in operation in the Pacific for 17 years and nationally for 37 years. The national program and to a large extent, the Pacific Region programs are funded by the U.S. Army Research Office, the Office of Naval Research and the U.S. Air Force Research Office. Additional program support is provided by the Embassy of the United States, Tokyo, Japan, and Obana Ltd., Tokyo, Japan. Scholarships are awarded to the best student researchers.

Who: All grades 8-12 students enrolled in Pacific Area Department of Dependents' Schools are eligible to participate in the program.

Where: The actual Pacific Region Symposium is held each spring in Tsukuba City, Japan. The 120 students who attend the Symposium each year present the results of their research to other attending student researchers and adults. While at the Symposium, students also visit Japanese research facilities, listen to guest speakers and attend cultural events. The research conducted by students is done in their schools and in laboratories near their schools.

Why: The goals of the program are to: promote research and experimentation in the sciences, mathematics and engineering in grades 8-12; recognize the significance of research human affairs; recognize talented youth; encourage student researchers to continue their research efforts in science, mathematics and engineering; expend the horizons of research-oriented students; increase the pool of future adults capable of conducting research.

When: The yearly program begins on January 1st of each year and ends the following year with the spring Symposium. The National Symposium, attended by three regional participants, is held in the U.S. each year in early May.

How: To be eligible for attendance at the regional Symposium, a student must complete an acceptable research project, and write an acceptable research paper

CHAPTER ELEVEN
PROGRAM OBJECTIVES

The symposium objectives are to:

- **PROMOTE** research and experimentation in the sciences, mathematics, and engineering at the grades 7-12 level.
- **RECOGNIZE** the significance of research in human affairs, and the importance of humane and ethical principles in the application of research results.
- **SEARCH** out talented youth and their teachers, **RECOGNIZE** their accomplishments at symposia, and **ENCOURAGE** continued interest and participation in the sciences, mathematics, and engineering.
- **EXPAND** the horizons of research-oriented students by exposing them to opportunities in the academic, industrial, and governmental communities.
- **INCREASE** the number of future adults capable of conducting research and development.

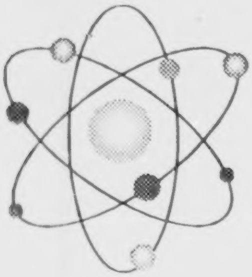
These objectives are identical to the objectives of the National Junior Science and Humanities Symposium

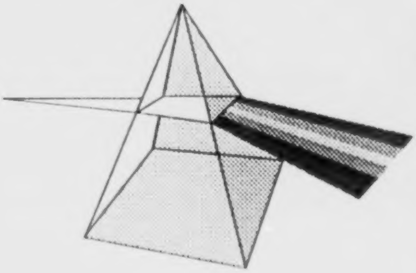
NOTES

CHAPTER TWELVE
REGIONAL PROGRAM THEMES

The following Symposium themes were drafted for school years 1987-1988 through 2003-2004. Student researchers need not direct their investigations toward the theme of the year. The theme should be advertised in participating schools by Junior Science and Humanities Symposium coordinators, and school administrators. Program themes are intended to encourage students [who might otherwise not conduct a research project] to participate in the program.

School Year	**Theme**
1. 1987-1988	The World Ocean Our Last Frontier
2. 1988-1989	Space Challenge of the 21st Century
3. 1989-1990	Science and Humanities - The Eternal Quest
4. 1990-1991	The Integration of Science and Technology for Mankind
5. 1991-1992	Biotechnology - Designs for the Future
6. 1992-1993	Telecommunications - Conversation with the Stars
7. 1993-1994	The Cosmic Connection
8. 1994-1995	Project Civilization
9. 1995-1996	Waste Management- Reduce, Reuse, Recycle
10. 1996-1997	Population - Exponential Growth in a Finite Environment
11. 1997-1998	Energy - Exploring the Alternatives
12. 1998-1999	Energy - Our Fusion Future
13. 1999-2000	Immunology - Protecting Our Future
14. 2000-2001	Science - Solving Problems of the 21st Century
15. 2001-2002	Extinction - Historical Precedence, Future Choice
16. 2002-2003	Super Science - Computers, Conductors, Colliders
17. 2003-2004	Atmosphere - The Other Ocean





CHAPTER THIRTEEN
PROGRAM PARTICIPANT ELIGIBILITY

Participation in the Pacific Region Junior Science and Humanities Symposium program is open to all students enrolled in grades 7-12 of Department of Defense Dependents Schools Pacific Area schools: [1] who are interested in conducting research projects in the sciences, or; [2] are interested in writing research proposal for conduct of science research at a later date. To attend the Symposium, program participants must complete a research project, or write a research proposal, as defined in the other sections of this document.

NOTES

CHAPTER FOURTEEN
SCHOLARSHIPS AND AWARDS

GENERAL: The JSHS program includes three types of financial rewards for participation. There are scholarships, and trips for students, and a financial award for a teacher. There also are awards for program participation.

- **Scholarships**: There are Regional scholarship and National scholarships.
  - **Regional Scholarships:** Usually, three regional scholarships are given to students.
    - ⇒ $4000.00 is awarded to the student judged to have conducted the best research project for the year. The scholarship is presented to the student at the Symposium in Tsukuba City, Japan.
    - ⇒ $500.00 is awarded to the student judged to have conducted the second best research project during the year.
    - ⇒ $500.00 is awarded to the student judged to have conducted the third best research project during the year.
  - **National Scholarships**: There are two National scholarships for students.
    - ⇒ $16,000 is awarded to the student judged to have conducted the best research project in the national presentation session to which that student is assigned. There are normally six students per national presentation session.
    - ⇒ $10,000 is awarded to the student judged to have conducted the second best research project in the national presentation session to which he or she is assigned.
- **Trips**: There are Regional trip awards, and a National trip award.
  - **Regional Trip Awards**: The three regional symposium students judged to have conducted the best research are awarded an all expense paid trip to the National Junior Science and Humanities Symposium.
  - **National Trip Award**: The student judged to have conducted the best research project in the presentation to which he or she is assigned is awarded an all expense paid trip to the International Science Youth Forum in London, UK.
- **Mentor Award**: The mentor of the top grades 9-12 student receives an award of usually $500.00 from the U.S. Army Research Office. The award must be used by the recipient to purchase science equipment for his of her school. When the student's mentor is not a member of the high school faculty, the award

shall go to the high school science department of the student's high school. In this case, the funds must be spent for equipment in a subject related to the area in which the winning student conducted his or her research.

- **Participation Award**: When funds are available, everyone who participates in the Symposium receives a book of some sort related to research.

NOTES

CHAPTER FIFTEEN
FEES

A $40.00 non-refundable application fee is required of each program participant who wishes to attend the Tsukuba City, Japan Symposium, except as noted below. The fee must accompany a student's application [due December 15] for participation in the Junior Science and Humanities Symposium. The payment must be made by check [cash will not be accepted] payable to the Pacific Region Junior Science and Humanities Symposium.

EXCEPTION. Students will receive a refund if: [1] they have completed all of their research work; [2] they have submitted their research paper, and; [3] they are not selected to attend the symposium as a result of lodging space limitations in Tsukuba City, Japan.

NOTES

CHAPTER SIXTEEN
SCHOOL PROGRAM COORDINATORS

School level Junior Science and Humanities Symposium Program Coordinators are assigned by local school administrators. Coordinators may be paid as part of a schools extra curricular activity program. Coordinators may also be mentors, or sponsors [see Symposium Mentors and Sponsors]. Coordinators insure that the school level JSHS programs function in accordance with the guidelines set forth in this publication. Some examples of Coordinator functions are to insure that:

- Participating students meet the published time requirements listed in this document.
- Student application forms are submitted.
- Sponsor application forms are submitted.
- Student application fees are paid.
- Parental permission slips are obtained and maintained on file at the school.
- Students' research papers, and proposals are submitted in time to meet program deadlines. A coordinators check-off-list is included at the end of the chapter.
- Students are provided travel orders for attendance at the regional symposium.
- When necessary, students are helped to locate mentors, working in the community, who are non-Department of Defense Dependents Schools personnel.
- Insure research project mentors are willing to guide one or more students through their entire research project. Some examples of professional people who have served as mentors in the past are scientists, medical personnel, and university professors.

Coordinators may be teachers in any academic discipline but, preferably they teach science, mathematics, or computer science.

NOTES

COORDINATOR'S CHECK-OFF-LIST FOR RESEARCH PAPER SUBMISSIONS

PURPOSE: This list was developed to help JSHS program coordinators decide whether or not a students research paper is acceptable for submission as a report of a completed research project. A no answer to any single yes/no question is an indication a JSHS project does not meet acceptable standards.

- **Student's Name**: ____________________
- **Research Project Title**: ____________________
  ____
- **Research Field in Which the Project Was Conducted**: ____________________
- **Project Start Date**: ____________________
- **Project Completion Date**: ____________________
- **Partner's Name [if applicable]**: ____________________
- **Mentor's Name**: ____________________

Yes/No Questions

QUESTION	YES	NO
• Project literature search included?		
• Literature search identified project relevant literature?		
• Research paper includes a literature section?		
• Literature in cited in the context of the report?		
• Research paper includes an abstract?		
• Research paper includes an Introduction section?		
• Introduction section includes project rationale?		
• Introduction section includes hypothesis or research questions?		
• Introduction section includes a brief history of the research problem?		
• Research paper includes methods and materials section?		
• Research methods is written in such detail that the project could be conducted by some other researcher?		
• Methods and Materials section was read and approved by the project mentor?		
• Paper includes data or results section?		
• Data or results section includes a written description of the data?		
• Paper includes a discussion section?		
• Paper includes a conclusions section?		
• Conclusions are related to research questions/hypotheses?		
• Conclusions are related to data?		

SYMPOSIUM STUDENT TIMELINE

PURPOSE: The student timeline is included to help students and mentors follow a schedule which provides deadlines. Many good student researchers have problems with their symposium projects and subsequently do not attend a symposium because they do not have target dates and are not able to pace themselves. They thus do not finish in time to submit their project paper by the annual 15 January submission deadline.

Student Timeline

Jan. 01 - Aug. 31	Explore project ideas and identify a suitable **MENTOR**	S
Sep. 10	Project ideas and mentor selection **DUE**	T
Sep. 10 - Sep. 20	Begin **Literature Search** and develop **Problem Statement**	U
Sep. 21	Problem Statement **DUE**	D
Sep. 21 - Oct. 07	**Continue Literature** Search to develop **Hypothesis & Methods**	E
Oct. 08	**Hypothesis DUE**	N
Oct. 08 - Oct. 20	Develop **Experimental Design** and conduct preliminary research	T
Oct. 21	**Experimental Design DUE**	
Oct. 21 - Nov. 25	Perform bulk of **Research Tasks**, draw initial conclusions to determine whether or not additional research is necessary	T I
Nov. 26	**Data DUE**	M
Nov. 27 - Dec. 08	Continue research as necessary	E
Dec. 09	**Results** [with data] **DUE**	L
Dec. 09 - Dec. 14	Work on **Conclusions**	I
Dec. 15	**Conclusions** [with data & results] **DUE**	N
Dec. 15 - Dec. 26	Work on **Research Paper**	E
Dec. 27	**Smooth Draft** [research paper] **DUE**	
Dec. 27 - Jan. 05	Revise research paper	
Jan. 06	**Final Draft** [research paper] **DUE**	
Jan. 06 - Jan. 10	Write [research paper] abstract	
Jan. 11	**Final Draft of Abstract DUE**	
Jan. 11 - Mar. 25	Prepare for regional symposium and work on project for next year	
Mar. 25	Attend regional Symposium	
Apr. 01 - May 01	Prepare for National Symposium	
May 01	Attend National Symposium	

MENTOR'S CHECK-OFF-LIST FOR RESEARCH PAPER SUBMISSIONS

PURPOSE: This list was developed to help JSHS program mentors decide whether or not a students research paper is acceptable for submission as a report of a completed research project. A no answer to any single yes/no question is an indication a JSHS project does not meet acceptable standards.

- **Student's Name**: ______________________________
- **Research Project Title**: ______________________________
  ____
- **Research Field in Which the Project Was Conducted**: ______________
- **Project Start Date**: ______________________________
- **Project Completion Date**: ______________________________
- **Partner's Name [if applicable]**: ______________________________
- **Mentor's Name**: ______________________________

Yes/No Questions

QUESTION	YES	NO
Project literature search included?		
Literature search identified project relevant literature?		
Research paper includes a literature section?		
Literature in cited in the context of the report?		
Research paper includes an abstract?		
Research paper includes an Introduction section?		
Introduction section includes project rationale?		
Introduction section includes hypothesis or research questions?		
Introduction section includes a brief history of the research problem?		
Research paper includes methods and materials section?		
Research methods is written in such detail that the project could be conducted by some other researcher?		
Methods and Materials section was read and approved by the project mentor?		
Paper includes data or results section?		
Data section includes a written description of the data?		
Paper includes a discussion section?		
Paper includes a conclusions section?		
Conclusions are related to research questions/hypotheses?		
Conclusions are related to data?		
Recommendations for further research are included?		
Limitations of the research are included?		

CHAPTER SEVENTEEN
RESEARCH PROJECT MENTORS

Mentors are people who: [1] guide students through the conduct of a research project; [2] provide guidance to students when they write research reports, and research proposals. They are consultants to whom beginners turn as they work their way through a research project. From a beginning students perspective, they have all of the answers regarding research methodology, writing skills and so on. They are often likened to a thesis, or dissertation advisor in graduate school. They help students:

- Design their research projects.
- Make observations.
- Conduct literature searches.
- Formulate hypotheses, or research questions.
- Gather data.
- Analyze data.
- Write research papers.
- Write research proposals.

Mentors may be teachers, school administrators, scientists, medical personnel, mathematicians, computer specialists, and others working in the schools and local communities. Mentors may also be program coordinators and sponsors.

NOTES

CHAPTER EIGHTEEN
SCHOOL SPONSORS

School sponsors are people who accompany students from their schools to the Pacific Region Junior Science and Humanities Symposium in Tsukuba City, Japan. They also may be program coordinators, and mentors. School sponsors serve as poster session judges, field trip monitors, and research seminar participants at the Symposium.

NOTES

CHAPTER NINETEEN
PROGRAM OPTIONS FOR STUDENTS

GRADES 9-12: For students in grades 9-12 there are two options by which they can participate in the JSHS program.

- **All Students**: Conduct a research project and write a research paper.
- **Grades 9 & 10 Students Only**: Craft a research proposal, with the remainder of the research project accomplished the following year.

GRADE 8: Conduct a research project and write a research paper.

NOTES

CHAPTER TWENTY
RESEARCH PROJECT GUIDELINES

TYPES OF ACCEPTABLE PROJECTS. The following types of research may be conducted by students who participate in this program.

♦ **Naturalistic Observations**. Naturalistic research is an observational form of research where a researcher observes the behavior of something. It might, for example, be of interest to know whether the common periwinkle, *Littorina obtusata* is a negatively or positively geotoxic at low tide, or perhaps is not at all effected by gravity under exposed conditions. A thorough literature search may identify some mollusks that do migrate toward the low water line once they are stranded by receding tidal water.

It seems evident there should be few restraints on naturalistic observations. Accordingly, the researcher intervenes in the natural setting as little as possible. The natural behavior of the marine gastropod under real world conditions is of primary interest to the investigator. For those reasons, therefore, the researcher imposes few if any controls on the subject or subjects intervening seldom if ever with the subjects being observed. When observations are made, however, they are made with consistency. Data would always be gathered at the same time during the tidal cycle; perhaps at the time of extreme low water within each tidal cycle. Observations might be made from mid-tide on the ebb tide to mid-tide or on the flood tide. As you can see, the natural behavior of the periwinkle is important but not without trying to understand other factors which might either support or nullify an eventual decision to state that this organism is either negatively, positively or not geotoxic at all.

Observations for this type of research are recorded consistently each time they are made. To accomplish the task student researchers use a field or research notebook in which to record their data.

Naturalistic observations may be conducted in both the physical and biological sciences. Suppose it is feared the construction of a new paper mill by Georgia Pacific in Old Town, Maine will effect local flora and fauna. Researchers could take stack gas samples for analysis in a laboratory. Beginning student researchers might gather rain water samples from close and distant locations to the paper mill. The samples could then be analyzed for pH, and formaldehyde content, while at the same time a record of the appearance of vegetation and animals at the two locations could be made. Other methods are of course, the same as those discussed previously. Field notebooks are used, and no attempts are made to alter existing conditions.

What does this type of observational research provide investigators? Low constraint research of this type is often used to provide a baseline of information when a new line of research is beginning. We should always remember Charles Darwin's trip on the Beagle and his subsequent writings titled, *On the Origin of the Species* when we think of naturalistic observations. His success in providing a basis for much of the origins of biologically, ecologically focused science was his industry in observing and collecting facts.

♦ **Case Study Research**. Case study research, like naturalistic observations is an observational type of research. Like its predecessor, in this type of research, few constrains are used. Close comparison, however, shows investigators to intervene somewhat more in this type research than in the former. While naturalistic observations are carried out usually in a natural setting as mentioned previously, case study research is carried out with one subject at a time in an interactive, or face-to-face situation. In case study research, investigators make no attempt to control independent variables, but look at fewer characteristics than they would when making naturalistic observations.

Many notable researchers have used case study research. Sigmund Freud became world renown for his clinical observations. His methods included interviews with subjects during which he allowed them to think freely. His subjects described their dreams, fears, fantasies and more.

Another example of case-study research is found in the work of Jean Piaget, the Swiss genetic episthomogist [who started his career as a marine paleontologist]. Piaget studied one child at a time in natural or informal settings to gain an understanding of children's normal cognitive development.

Piaget's case-study work had profound effects on contemporary science education. Today, grand debates rage about the best ways to teach science. It is, however, generally accepted that students construct their understandings of reality by gaining experience through direct or first hand experiences with concrete reality, a direct spin-off of Piaget's work.

When should beginning research students use case study research? The following when list applies case-study research, and to naturalistic observations as well.

- When investigating a new area for which little information is available in the literature.
- When students desire to gain familiarity with typical characteristics of settings or subjects before conducting higher-constraint [more highly controlled] research for similar settings or subjects.
- When research questions specifically focus on the natural flow of behavior and, or on behavior in natural settings.
- When a study focuses on a single individual, group or set of events, and the research questions

are specifically about those people, settings or events.

- When examining demonstrations and illustrations like a demonstration of a new procedure.
- When researchers need to discover contingencies that can be used as a basis for higher constraint research.
- When, after completing higher-constant laboratory research, investigators want to know if laboratory findings hold true for the behavior in the natural environment.
- When it is necessary to describe events never before observed [like the astronomical collisions with Saturn].
- When it is necessary to identify contingent relationships among variables.
- When it is necessary to develop a basis for hypotheses to be used in higher-constraint research.
- When researchers are attempting to negate general propositions.

There are myriad examples of case study research. One high school student was interested in gaining an understanding of what students in her school knew about the [flawed idea] relationship between the use of hard drugs and the smoking of marijuana. A ninth grade boy wanted to know something about the effect of increasing incursion of bull moose into Anchorage, Alaska during rutting season, upon the fears of elementary students.

◆ **Correlation Research**. Correlation research is more highly controlled [or constrained] than case study research and the relationship of two variables may be quantified. This, however, does not mean that the two variables being examined are controlled. To the contrary; in research it is sometimes not possible, not desirable or inconvenient to reduce the fluctuations of a variable. In such cases it may be possible to record the natural occurring changes in a variable and subsequently compare them to the parameter being studied. The objective in this type of research is to identify some relationship, and describe it, usually mathematically using a range of numbers between -1 to +1.

An outstanding example of correctional research is found in a study reported by a high school student named Gilman. Gilman noticed that there was a significant difference between wood production in a pine forest fronting on a rural road and a like pine forest fronting on a major highway. She reasoned that a high rate of exhaust gas pollution caused a decrease in wood production. Further, she predicted that traffic counts would be good predictors of wood production. She examined traffic count data for an 18 year period, correlating it with tree ring areas in square millimeters. She found tree ring area highly, negatively correlated to traffic count.

That is the higher the traffic count, the lower the tree ring area.

We note that neither tree ring growth nor traffic count were controlled in this study. A cause-effect relationship seems to have been established. Traffic count [the amount of exhaust gas pollution] controlled wood production or stated another way, wood production depended negatively upon traffic count.

When Gilman collected an evaluated her data she used two approaches. the first was tabular as shown in Table 1. The tabular form was simply an easy way of arranging data in her field notebook. Once the data were collected, a scatter plot was constructed, and a best fit curve drawn so that the apparent relationship could be examined.

TABLE 18-1
TRAFFIC COUNT - TREE RING AREA DATA

YEAR	TRAFFIC COUNT VEHICLES PER YEAR	TREE RING (mm^2)
1965	26,240	1149.42
1966	26,010	1011.50
1967	27,325	966.680
1968	30,010	819.769
1969	30,090	931.373
1970	28,795	824.337
1971	30,470	964.514
1972	32,930	1021.28
1973	33,940	902.85
1974	31,690	866.515
1975	34,040	932.333
1976	35,540	869.129
1977	38,440	649.712
1978	41,760	605.717
1979	43,150	506.946
1980	41,070	560.024
1981	42,330	617.351
1982	43,700	437.180
1983	44,140	348.047

- **Differential Research**. In differential research, two or more groups are separated based upon some variables that existed before the research started. One student researcher knew that within narrow limits, the ages of surf clams, *Spicula solidisima* could be determined by counting the rings on the shells. Prior to beginning a study of the effect of hurricane Zelda on the *Spicula* population at Old Orchard Beach, Maine, the student divided *Spicula* into four age groups, from one to 15 years. The preexisting variable is age and it is also a quantitative variable. Another student, interested in studying the survival rates of the marine amphipod, *Ampithoe lacertosa* isolated in tidal pools subjected to constant sunlight, divided the amphipods in two categories before beginning her research; male, and female. In the latter example the variable was sex, and it is qualitative.

In differential research, the classification variable is the independent variable in the study to be conducted. In the first example, age is the independent variable and in the second study, sex is the independent variable.

The behavior measured in different groups is the dependent variable. In the first example, the dependent variable cannot yet be identified. In the second example, the survival rate is dependent upon sex.

Another feature of research conducted in this category is that neither variable is manipulated by the investigator. Rather, the variables are only measured. Researchers use differential research designs most frequently when manipulation of the independent variable is impractical, impossible or inappropriate. With two examples provided previously, it would be impossible to manipulate the independent variables: age and sex.

♦ **Experimental Research**. True experimental research boasts five characteristics.

- It includes one or more hypotheses about predicted causal effects of independent variables upon dependent variables. One student predicted wood production, in trees adjacent to herbicide-treated fields, would be less than wood production in trees adjacent to non-herbicide-treated fields. Another student predicted that population densities of lichens in the genera *Leprarid* and *Sobaria* would be inversely related to the sulfur dioxide $[SO_2]$ content of the surrounding air in a particular locale.

- The research includes at least two levels or categories of the independent variable. As previously noted independent variables reflect some conditions existing prior to the commencement of research. Two examples were used earlier: sex and categories of ages. In the case of the sex, there were two categories of the independent variable, male and female. With age there were several levels of the independent variables, ages 1, 2, 3 . . . years.

- Subjects are assigned to groups or conditions in an unbiased manner. Assignments for example may be made using a table of random numbers.

- The experimental design includes specific procedures for testing the hypothesis. A student studying the effects of acid rain upon the upper centimeter of ocean and fresh water following April rain storms, when the prevailing winds blow paper company stack gases over Sprout lake close to Alberni Inlet on Vancouver Island, hypothesizes the rain water will consistently increase the pH a greater amount in the lake water than in the Inlet. To test the hypothesis, a highly controlled system is developed to take water samples from the lake each day at a specific time and following each period of rain as well. As part of the experiment, control samples are also drawn daily from a cove on the Strait of Georgia and a pond close to the Strait. While not described here, procedures for taking water samples, the depth at which the samples are drawn, and the times at which they are collected, as well as associated weather analysis are meticulously described. All procedures are highly controlled.

- The research includes controls for major threats to internal validity. Internal validity concerns itself with whether the independent variable was responsible for the variance observed in the dependent variable or whether the variation was caused by some random intervening or extraneous variable. The more tightly and carefully the controls are placed upon the research project, the less likely the results are to be comfounded by extraneous factors and the more confidence users of the research will have that the research results can be used beyond the sample used in the study.

Without using a control, like sampling in two different areas, it is easy to see how some cause and effect relationship between two variables might be suspect. If weather conditions in a particular area apparently cause an increase in the acidity of surface water, without a control not subject to the weather conditions and the close proximity of stack gases laden with acidic and acid forming compounds, it might be argued that the change in the acidity could be the result of spring overturn mixing surface waters with nutrient rich waters from lower depths. Obviously using a control area or group from which to sample does not rule out all possibilities the observed phenomenon is not caused by some as yet unidentified variable. The better the research design, the more tightly will be the controls and the more stringent will be the criteria for establishment of a control group.

The following list of possible intervening variables were compiled.

[1] Maturation. The animal being observed becomes bigger, stronger, more experienced and more sophisticated. Feeding habits of infant mice may be due to maturation and not the increased ability of food variety.

[2] History. History is something that happened in the past which could have a confounding influence upon the present study. A research team decided to examine the effect of caloric intake level upon weight and height gain in 12 year old males strictly lectured upon composition of adequate and proper diet. The study was to be conducted over a six month period, the males weight and height data being collected weekly by the school nurse. After three months, some students reverted to previous behavior, eating excess quantities of starchy high calorie foods. The previous habits of some students confounded the data. Had the data gathering period been shorter, the subjects might not have reverted to previous habits.

History is an especially important factor when beginning researchers use human subjects in their studies.

[3] Testing. For many years B.F. Skinner, his students and others demonstrated that when tests were repeated, subjects became test wise, subsequently performing better as the number of tests they took increased. Beginning research students interested in studying animal behavior should be aware of this factor. Monkeys may only be interested in eating bananas if all they ever are provided as food are bananas.

[4] Instrumentation. Several things can happen to instruments in the data gathering process. Researchers sometimes forget to calibrate instruments. Instruments also age, becoming worn in different places. Sometimes instruments are employed differently from subject to subject, and from setting to setting.

[5] Regression Toward the Mean. Regression toward the mean focuses upon sample selection from the population. A student, interested in studying an aspect of gerbil behavior felt more intelligent gerbils would respond more rapidly, demonstrating the particular behavior. A test was subsequently located the score of which would identify raw gerbil intelligence. The test publisher provided mean test score figures. It was decided to select the sample randomly from all gerbils scoring one standard deviation or higher above the published mean test scores. After the sample of gerbils to participate in the research had been selected, the student decided to administer the test again. As a result of the second test administration, only 50% of the gerbils scored one standard deviation or higher above the mean published test score. The scores of the remaining gerbils had regressed toward the mean.

What happened in the first testing? It could be that on the first test the gerbils were lucky!

[6] Sample Selection. When it is necessary to select a sample of anything from a larger population, that selection should be accomplished using random

selection techniques. This statement applies whether an investigator is examining bridge bolts, trees, or mice from larger populations to serve as subjects.

[7] Attrition. Ainley, Leheshe and Shaden conducted a long term study of the breading biology of Addelie penguins. One interest they had was establishing the age at which the birds become sexually mature. Had their sampling procedures been inappropriate, or had several year groups of immature birds succumbed to catastrophic environmental events or some other milady, the study might not have been a success. Too few individuals of known age might have remained to support continuation of the research, a problem exacerbated because marine birds while sexually immature appear like sexually mature adults.

A similar problem arose when a Junior Science and Humanities Symposium researcher decided to examine the sleep habits of high school women. Many young women volunteered to be subjects in the study, the majority of whom were serious. The young researcher forgot that many high school seniors are not in school the second semester of the senior year because they have met the graduation requirements and so chose to work so they could have extra money to pay college bills. This simple error destroyed her study. Only a few underclass students remained as subjects.

[8] Experimenter Effects. A high school research team observing the behavior of mice noticed a preference for one food over others. They hypothesized that juvenile mice fed with a specialized protein enhancer would show a more rapid weight gain over time than mice fed a regular diet. Experimental group mice then were provided an endless supply of food through a specially built automatic feeder. The control group was fed its normal diet and given the same quantities of food they normally received and consumed. The experimental group mice gained weight faster than the control group mice. This was the result expected by the experimenters. We note here that the results were biased by experimenter expectancies.

Experimental group feeding behavior was influenced by the availability of an endless food supply. Mice behavior was influenced in support of the hypothesis. The researchers originally reasoned that since mice appeared to eat only until their bodies regulated, they had consumed enough food. They further reasoned that use of the automatic feeder would not have an effect on the results. Finally, the students had only one automatic feeder available to them thus both control and experimental groups did not have the same access to food supplies.

Student researchers often unintentionally tend to make decisions and choices which favor the hypothesis being tested. Their actions, however, are unintentional, and data are not deliberately or knowingly falsified.

Beginning student researchers must constantly be reintroduced to the idea of experimenter bias, by their mentors. Student investigators come from success oriented school environments. They tend to view research projects which generate data not in support of hypothesized outcomes, as failures. Throughout their school careers they have been taught to make predictions, carry out some experimental procedures, and the expected results will surface. But what if the expected does not occur? Was the experiment a failure? From a research perspective, the answer is no. Acquisition of specific results can only be predicted. All student researchers have in the end are the data they gathered. If experimenter bias is not present, then the data is simply data. It is not correct or incorrect data. The data either completely supports, supports to some degree, or does not support the previously formulated hypothesis. Rejection of an hypothesis is a finding as significant as acceptance of the hypothesis. Mentors are well advised to hold regular discussions with their students regarding research project success. Well designed, highly controlled, experimental research free of biases is always a success. Whether a project hypothesis is accepted or rejected is not part of the success equation. Researchers the world around work diligently in the search of drugs to combat the AIDS virus. Each time a new drug shows promise after adequate evaluation using acceptable screening procedures a study is designed to test the effects upon human subjects. Two possible outcomes of such research exist: [1] the drug will not be successful controlling the virus, and; [2] the drug will be successful controlling the virus. In the first case, the researcher was successful since the work led to the elimination of another chemical from a long list thought to have potential. There are hundreds of chemicals with potential. Eliminating those which will not control is a Herculean task at best requiring the efforts of thousands of researchers. That the second researcher was successful, will be heralded throughout the world, and no doubt the researcher will become a Nobel Laureate, in no way decreases the importance of the first researchers findings.

IDENTIFY VARIABLES. After students have identified the types of research they will conduct we move to identify variables. As readers know, some research types may or may not have dependent variables and independent variables. There is a failing among many teachers who attempt to help students get started in research. The failing is the feeling that in order to be classified as research, studies must have dependent and independent variables. This is not the case. While Ainley, LeReshe and Slader [1983] were interested in breeding behavior of Addelie penguins, they did not have variables other than those they established as a result of their investigations. Interestingly enough, however, they did establish some apparent correlation as a result of their attempts to identify baseline breeding behavior. Theirs was a study which falls in the category of naturalistic observations.

There is another caution for teacher-mentors. There is a tendency among people who hold advanced degrees in fields other than science to guide, even force beginning students to do experimental research. The perception is that any study that does not manifest a highly controlled situation in which there are treatment groups, control groups, and before-after comparisons [pre-post], is not a true study or true research. The converse of course is true. There are many types of research all equally valid dependent upon the research objectives.

SCIENTIFIC METHOD. The scientific method is used in all research projects. The method generally includes the following:

- **Identifying a Problem.** Identification of an apparent problem through observations of the real world, as a result of searching the literature or through some combination of events.
- **Data Collection**. Gathering all pertinent problem related data.
- **Hypothesis and Research Question Formulation**. Formulating an hypothesis, or research question/s [may be more than one].
- **Observations, Experiments, and Data Gathering**. Performing experiments to test the hypothesis, or gathering data to help answer the research question/s.
- **Interpretation of Findings**. Interpreting the results of the experiments [usually accomplished through data analysis, and comparison of new data with what is already known about a problem].
- **Drawing Conclusions Based Upon Evidence**. Drawing one or more conclusions about the hypothesis or research question/s based upon evidence.

LIBRARY RESEARCH. Students often conduct library research projects, falsely thinking that such endeavors are a correct application of the scientific method. Generally, this is not the case. While literature searching is part of the science research process, it is not, in and of itself, acceptable as a Junior Science and Humanities Symposium project. Proper application of the scientific method by student researchers is weighed heavily when papers are evaluated. The evaluation determines which projects [therefore who] will be presented formally at the Symposium. Projects which do not involve all steps of the research process will not be presented formally at the Symposium.

USE OF ANIMALS IN RESEARCH. Animal experiments are subject to a variety of laws, regulations, and guidelines. The federal Animal Welfare Act of 1966 sets standards for handling, housing, transportation, feeding, veterinary care, and use of pain-relieving drugs for dogs, cats, non human primates, rabbits, hamsters, guinea pigs, marine mammals, and other farm animals in nonagricultural research.

The Health Research Extension Act of 1985 sets forth federal policy for humane care and use of laboratory animals.

The combination of the two Acts brings almost all researchers under the oversight of a local review committee known as an Institutional Animal Care and Use Committee. These committees always include a veterinarian experienced in laboratory animal care, and at least one person not affiliated with the institution to represent the interests of the community. Among other things, committees inspect animal research areas, and review proposed experiments to ensure that animals used in research will be used humanely.

A widely accepted guide for animal use in the laboratory is, *Guide to the Care and Use of Laboratory Animals*, published by the National Research Council, U. S. Department of Health and Human Services, Washington, D. C., 1985.

The use of animals in research projects shall be closely monitored by local school officials. If deemed necessary, a committee as described above shall be set up to monitor research projects using animals. In this regard, the following guidance applies:

- **Unacceptable Projects**. Projects leading to the needless killing of animals, or projects in which there is high probability that the research will lead to the death of a research animal are not acceptable as Junior Science and Humanities Symposium research projects.

- **Disapproved of Projects**. Projects where there is a chance the research will lead to death of research animals should be evaluated by a board of science teachers and other personnel prior to their approval. The board should evaluate the proposals to ensure that all possible precautions to prevent the death of a/the animal/s have been taken. If, after evaluation of the project, the board feels there is still a high probability that the death of a research animal will occur regardless of the precautionary measures that are taken the project should not be approved.

- **Acceptable Projects**. Projects where there is a slight chance [local determination] a research animal may die are acceptable. Project research methods, however, must be scrutinized closely by mentors prior to project approval. All possible precautions must be taken to prevent the needless loss of research animals.

CHAPTER TWENTY-ONE

RESEARCH PAPER ORGANIZATION

Research papers must include the following sections: **Abstract, Introduction, Methods and Materials, Findings, Discussion, Conclusions, Limitations of the study, Recommendations For Further Research, and Literature Cited.**

TITLE. The project title is the first part of the research paper seen by potential readers. It should be concise, and specific. Titles are worded to convince potential readers the research paper Abstract should be read. Four example titles which meet these criteria follow:

- *Determination of the Activation Energy and Order of Reaction for a Lightstick*
- *The Effects of Slopes and Reefs on Water Waves*
- *Ultraviolet Weathering of Polypropylene, an Example of a Photo-Chemical Process as a Function of Color*
- *Mitotic Activity Associated with the Initiation of Budding in Hydra*

ABSTRACT. The abstract follows the research report title. It is an overview of the research described in the report. Investigators cite their research methods, findings, and conclusions in this section using sufficient detail to convince readers the entire report should be read. JSHS abstracts must not be longer than **250** words. Several abstract writing suggestions follow. Also, consult the chapter titled, "Abstracts."

- **Answer Questions**. Abstracts should answer the questions; Who; What; Where; When; Why; sometimes, How?
- **Tense**. The past tense should be used throughout the abstract.
- **Person**. The third person should be used to describe completed research.
- **English Usage**. Proper sentence structure, and grammar must be used.
- **Abbreviations**. Do not use abbreviations.
- **Assumption**. Assume readers will have a good technical vocabulary.
- **Specialized Vocabulary**. Try to avoid the use of highly specialized words.
- **Results and Conclusions**. State results or findings, and conclusions of the research in a clear, concise fashion.

Example Abstracts Of The High School Formal Paper Presentation Finalists

NAME: Kyle McGrevey
TITLE: A Comparison of Cycle Ergometry Test Scores on Teenagers and USAF Adults
SCHOOL: Kadena High School

Fitness is very important in everyday life. In the armed services having a high level of fitness could mean life or death in a war time situation. To insure that fitness level are acceptable the United States Air Force developed the cycle ergometry test.

This experiment tested five male teenagers female teenagers against five adult males and five adult females. The hypothesis was that the adults would score the highest.

The results of the experiment indicated that male teenagers have the highest level of fitness, female teenagers have the second highest fitness level, male adults have the third highest, and female adults have the lowest level of fitness. The hypothesis was rejected.

NAME: Yumiko Shimabukuro
TITLE: The Amount of Calcium in Aquatic Environment Affect the Amount of Calcium Present in the Fish Skeleton
SCHOOL: Kubasaki High School

The amount of calcium in the ocean is much higher than it is in a river. To determine the relationship between the calcium available in the environment and the calcium stored as bone in the fish, I compared thirty saltwater and thirty freshwater fish. I measured the amount of calcium in both types using the ratio of the bone weight to meat weight in grams. I found that the amount of bone in freshwater fish was slightly greater in proportion to meat that in saltwater fish. Furthermore, I performed a "Z test" to determine the significance between two means.

NAME: Jason Mapanoo
TITLE: Does *Pistia stratiotes* L. var. *cuneata* Have the Ability to Absorb Heavy Metal Lead From Water
SCHOOL: Taegu American School

This project determines the ability of the aquatic plant, *Pistia stratiotes* L. var. *cuneata*, to absorb heavy metal lead from the water. Since the lead's solubility is very low, it will tend to accumulate at the bottom. Aquatic plants having roots that touch the bottom were used so that the plants would have access to the lead that falls to the bottom. Tap water was placed in two containers. They were then doped with a solution of lead nitrate ($Pb(NO_3)_2$). Aquatic plants were placed in one of the containers, while the other was used as a control. After 72 hours, the plants were removed and the water samples were measured for their lead content and then compared to plants that were not exposed to lead.

NAME: Yumiko T. Shimabukuro
TITLE: The Effects of Carbonation on the Solubility of Calcium
SCHOOL: Kubasaki High School, Okinawa, Japan

Soft drinks have become America's number one beverage. Simultaneously, there is a growing urgency to obtain more calcium in the American diet. We should be reminded that all we consume are chemicals and these substances are potentially toxic but are hazardous only if consumed in sufficiently large quantities. In order to examine if carbonated drinks have potential to impede the process of calcium absorption in the body, four experiments were conducted. The first experiment involved calcium chloride and carbonated drink to test for the chemical reaction by itself. The second experiment included artificial gastric juice, calcium chloride, and carbonated drink to observe the chemical reaction that took place in the environment closer to the stomach. The third experiment was to display a transition from simulated stomach to a simulated small intestine; therefore it contained artificial intestinal juice, and the product from the second test. The first and third test results proved my hypothesis that it will produce calcium carbonate precipitate that is insoluble. Additionally, by means of extracting and weighing calcium carbonate crystals that were formed, I conducted the two sample t statistic to check correlation between different amounts of carbonation.

NAME: Breena Berte
TITLE: Does Temperature Effect the Growth of German Cockroaches?
SCHOOL: Zama High School, Camp Zama, Japan

The purpose of this research was to determine if temperature had an effect on the growth and development of German cockroaches. The cockroaches used were from a laboratory colony from CHPPM-PAC Environmental Lab at Sagami Depot, Japan. The cockroaches were placed in controlled temperatures [15°C, 25°C, and 35°C] and observed for three weeks. One group of cockroaches was kept to determine initial data. The data were then subjected to statistical tests. The cockroaches in 35°C grew the most, but had the most deaths. The cockroaches in 25°C grew less than those in 35C, but had less mortally as well. The cockroaches in 15°C had the least growth, and had the same amount of moralities as the cockroaches in 25°C. The results from this experiment supported the hypothesis; Temperature does effect the growth and development of German cockroaches.

NAME: Lee Ann Chen
TITLE: The Power of Suggestion. the Effect of Color on Flavor Decision
SCHOOL: Yokota High School, Yokota Air Force Base, Japan

The environment has preconditioned many color associations in people's minds; this study tests these associations. The purpose of this project was to find out if people associate taste and color. Psychologists have said the relationship between color and flavor is a learned association, and the reaction to this relationship becomes automatic. An example of this relationship is the color yellow, and the flavor lemon; most people tend to correlate the color yellow with the flavor lemon.

To test this relationship, people from different groups were given cups of differently colored lemonade at varying concentrations. The participants were asked to determine which was the strongest tasting lemonade. This study found that people chose the yellow colored solution to be the lemonade over other colors which also had the same level of lemon flavor concentration. This study concludes that the participants allowed the color of the solution to influence decision in the flavor of the tested solutions.

INTRODUCTION. The Introduction includes a number of items. First, what is already known [history] about the research problem is described. This information comes from a library search of relevant literature. When information from some sourse is used, the author's name is cited. Citations throughout the report, are written in one of two forms: [1] Jones (1998) found that....was a direct result of aging and growth; [2] It was noted that as the bivalve length increased the body mass also increased (Jones 1997). If report readers want additional information about the work of Jones, they consult the Literature Cited section of the report. A complete citation for Jones' article or book is included in that section. Some examples of citations are provided at the end of this section.

The second item included in the Introduction is the research project rationale. That is, a statement about why the researcher conducted the study. If a rationale cannot be identified, the study should not have been conducted.

The third item included in the Introduction is the project hypothesis [there may be more than one] or research questions. This is the hypothesis a researcher intends to accept or reject after analyzing research data, and or the research question to be answered as a result of project data analysis. Hypotheses and sometimes, research questions have a statistical link. A certain level of statistical significance is assigned to acceptance or rejection of an hypothesis. An hypothesis, for example, might be accepted at $p<0.05$ level meaning that the probability of the observed phenomenon being caused by something other than chance alone is less than five chances in 100. All of the items included in the Introduction are linked.

METHODS AND MATERIALS. The methods and materials used to conduct the research are described in this section. Methods are reported as exactly as possible in a step by step manner. This section must be written so specifically that the project could be repeated by someone not involved with the original project. Papers written to this degree of specificity are a credit to their writers. Papers reporting research studies that cannot be repeated using the information included in this section are not worth reading. Figures which help describe project procedures may be included here. When included, the word "Figure" begins with a capital letter and is placed at the bottom of the Figure. An example follows:

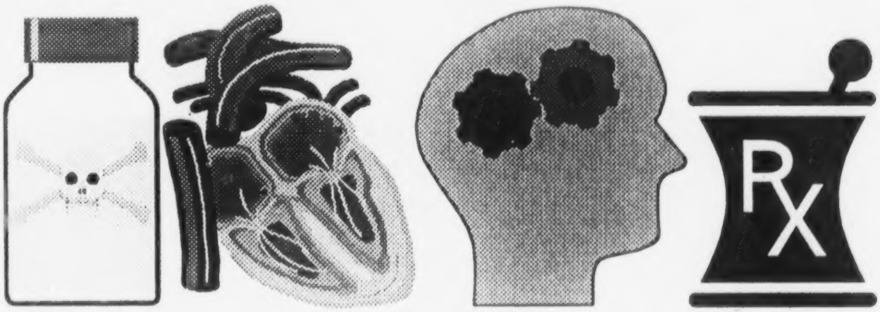


Figure 1. Causes of the Problem.

Materials and equipment used during the data collection portions of the research project are also included in this section of the report. The list is usually written in paragraph form. The way in which the equipment was used need not be included here, with the following exception. If the equipment was employed in an atypical manner, then they it was should be included here.

High school students often simply make two lists in this section and consider the section complete. This is an error. The section should begin with an introductory paragraph. Often the entire section is written in paragraph format.

FINDINGS. The results [often called data] of the research project are reported here. **Data are described in a paragraph format**. The description may also be supported by the inclusion of data tables and figures. Using tables and figures as the sole method of reporting research findings, without providing a written description of the findings is an error. This procedure is not an acceptable method of reporting study results. Although tables and figures provide visual overviews of findings, research results must be described in writing. When tables are used, the titles are printed above the tables they describe and the word, "Table," is always capitalized. Whenever a table is discussed in the report, the word, "Table," is also capitalized. Figure titles are always printed under the figures. The same capitalization rules apply to the word, "Figure," as apply to the word, "Table." See the example figure above and the table below. One point students must remember is that the results [or findings] are described here, not discussed.

Table 1
Hourly In Tide Pool Temperatures For Southwest Harbor 30 August 1995

Location	Time	Temperature (°C)
Coast Guard Base	0700	54.3

DISCUSSION. Research findings are discussed here. Relationships between the findings, and what is already known about the problem or research topic [history] must be included here. Links between the historical aspects of the research topic and the findings should be noted when they exist or appear to exist. What is already known about the research area was reported generally in the *Introduction* section of the paper. Thus, there is a relationship between the *Discussion* section and the *Introduction* section. Literature relevant to the discussion is cited in this section. Hypotheses and research questions are also discussed here. The discussion must also take into account the study findings providing a link between this section and the *Findings* section.

CONCLUSIONS. Researchers draw conclusions about the research project in this section of the report. Conclusions must be based upon information presented in the *Findings* section. This is usually the place in the report where hypotheses are either accepted of rejected based upon preset levels of statistical significance. Conclusions about research questions, when research questions are used in a study, are also made here. An important point is that all conclusions made here are based upon evidence included in the *Findings* section of the report. It is possible to combine this section with the Discussion section the report, a procedure often followed in research journals We prefer, however, that beginning researchers not unite the two sections.

LIMITATIONS OF THE STUDY. Limitations which effect the generalizability of the research results are stated here. Statistical techniques used to manipulate the data, for example, may not have been as powerful as expected, or incorrectly chosen. In such cases readers of a research paper should be cautioned about the possible effects that could be incurred when the research results are applied to new situations. Some of the observed treatment effect might have been caused by a random, uncontrolled, intervening variable. Again, readers should be made aware of the possibility. Other factors, over which the researcher had no control, that might have influenced the study outcomes, should be mentioned.

SUGGESTIONS FOR FURTHER RESEARCH. This is a list of suggestions which should be accomplished in additional research projects. The suggestions included here will help us better understand the area of research reported in the present paper. Additional research may seek to answer questions central or peripheral to the research discussed in the present report.

LITERATURE CITED. This research paper section is a list of all documents cited in the context of the report. Citations normally are listed alphabetically by the authors' last names. When an author is cited more than once, his or her works are usually listed with the earliest publication date first. In cases where two or more articles by the same author, published during the same year are cited, small letters follow the date, starting with "a" and proceeding [1995a, 1995b]. The letter is included in this section, and in the context of the report whenever the work of that author is discussed [see examples of dates in the *Introduction* section]. If an article or a text is not cited in a report, it is not included in this section. Some example literature cited listings are provided below.

LITERATURE CITED

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Tomlinson-Keasey, C. 1972. Formal operations in females aged 11 to 54 years of age. *Developmental Psychology* 6:364.

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NOTE

CHAPTER TWENTY-TWO
WRITING ABSTRACTS

GENERAL: An abstract shall be written for every paper which is submitted, and shall be on an abstract form of a copy of that form. The completed Abstract shall accompany the paper when it is submitted. An Abstract form is included in Appendix A, Abstract Forms, for this purpose. That form shall be used. Xerox copies of the form may be made to meet the needs of individual schools.

LENGTH: The abstract should be of adequate length to describe the project, but should not exceed 250 words.

WRITING: The abstract must be typed, and be single spaced. Hand written abstracts will not be accepted.

SUGGESTIONS FOR ABSTRACT WRITING:

- **Answer Questions**. Abstracts should answer the questions; Who; What; Where; When; Why; sometimes, How?
- **Tense**. The past tense should be used throughout the abstract.
- **Person**. Third person should be used to describe completed research.
- **English Usage**. Proper sentence structure, and grammar must be used.
- **Abbreviations**. Do not use abbreviations.
- **Assumption**. Assume readers will have a good technical vocabulary.
- **Specialized Vocabulary**. Try to avoid the use of highly specialized words.
- **Results and Conclusions**. State results or findings, and conclusions of the research in a clear, concise fashion.

EXAMPLE ABSTRACTS: Examples of abstracts are included in the chapter titled *Research Paper Organization*. In addition, three example are provided below.

NOTES

NAME: Laura Moody
HOME ADDRESS: PSC 76 Box 3532 APO AP 96319
SCHOOL: Edgren High School
SPONSOR/TEACHER: Daryl Coleman
TITLE: The Ability of the Non-Migratory Fish *O. latipes* to Follow a Chemical Trail in the Water

The amazing ability of salmon and other homing fish to find the exact stream in which they were born has long fascinated scientists. Studies show that salmon use the olfactory sense in locating their birth stream. The purpose of this experiment is to test whether non-migratory fish have similar abilities.

Fifty *O. latipes* (Japanese Ricefish) were placed in a container. A .001 M solution of SrCl was added to the water just before fish were fed. The number of fish rising to the surface upon the addition of the chemical was recorded. This was repeated 20 times (Learning Phase). Fish were then placed in a container modeling a stream system. At the mouth of each of eight streams a different chemical solution was added, including SrCl. Fish were allowed to swim freely for five minutes and the number of fish in each stream was recorded.

During the learning phase, the number of fish rising to the surface upon the addition of the chemical grew as more trials were completed, indicating that learning had taken place. When given a choice of eight streams, an insignificant number of fish located the stream with SrCl, demonstrating that the non-migratory fish *O. latipes* is unable to follow a chemical trail through the water.

NAME: Patrick Clancey
HOME ADDRESS: PSC 557 Box 264
SCHOOL: Kubasaki High School
SPONSOR/TEACHER: John Thomas
TITLE: The Effects of Cryogenic Treatment on the Elasticity of Copper

The strength of a material is related to the number of imperfections within the molecular structure of the material. If the movement of molecules is indeed slowed as temperature decreases, then it stands possible that imperfections within the crystal structure may be allowed to heal if the molecular motion is reduced.

The experiment measured the elasticity of two groups of copper wires. One group was subjected to cryogenic treatment using liquid nitrogen. The other group was not treated and served as a control. Using Young's Modulus, I was able to calculate the elasticity of both groups of metal. When comparing the two, the group that underwent the cryogenic treatment was measurably stronger.

NAME: LeeAnn Chen
HOME ADDRESS: PSC #78 Box 975 APO AP 96326
SCHOOL: Yokota High School
SPONSOR/TEACHER: Mr. Roger Larson
TITLE: Symmetrical Beauty; A Study on Facial Symmetry

Scientific studies have found that humans have a preference for a symmetrical body to an asymmetrical body, and that body symmetry is correlated with facial symmetry. The purpose of this research was to find it there was a human preference for the right or left side of a woman's face, and if there was a correlation between the measure of symmetry, or symmetricity, of a face, and its perceived attractiveness. It was also to be determined whether or not gender played a role in these preferences and perceptions of beauty.

Eighty participants were evaluated; forty males and forty females. It was found that both genders did not have a preference for either side of a female face, and that there was a correlation between the symmetricity of a face, and its perceived attractiveness. It was found that this correlation was stronger in the female perceptions than in the male perceptions of attractiveness. These findings are valuable asset for many consumer fields such cosmetic surgery and advertising.

HOW TO WRITE AN ANSTRACT

A properly written abstract consists of the **TITLE** of the study and the body of the **ABSTRACT**.

Title

Make your title concise, but also descriptive. See more infor-mation in "Research Report Preparation".

The Body of the Abstract

The abstract is a very brief overview of your **ENTIRE** study. An abstract should contain no more than 175 words. It tells the reader **WHAT** you did, **WHY** you did it, **HOW** you did it, **WHAT** you found, and **WHAT** it means. The abstract is the chief means by which scientists decide which research reports to read and which to bypass.

The "Abstract Worksheet" should help you to write the first draft of your abstract. The sequence of sentences in that "Worksheet" is ordered in a logical fashion, beginning with an **introduction** and proceeding to your **test, results, discussion,** and **conclusions**.

It is difficult for your writing to be both concise and descriptive, but that is exactly what is needed for a good abstract. Try to think of the most important items that crystallize each part of your project. **Leave out details** that can be summarized in overview fashion. As a first draft (using the Worksheet), try to write one sentence that **introduces** the experiment, one that explains your **test**, one that summarizes your **results**, one that **discusses** what you found, and one that provides a **conclusion** for your study. For your second draft, **include essential information** that needs to be conveyed to the reader and **delete unimportant detail**. For your final draft, make sure the abstract "flows" logically. Give it to a friend to read. Ask her to tell you what she thinks you actually did and what you found. **Revise** as necessary.

An example of an abstract is found on a following page. It was dissected to show you how it was constructed. Your abstract should be one solid paragraph.

ABSTRACT WORKSHEET

(Please use one concise sentence to summarize the most important aspects for each section listed below. Two sentences for Results are acceptable.)

PROJECT TITLE (Keep it concise, but descriptive)

INTRODUCTION (What is this project about? Why is this project interesting or important?)

HYPOTHESIS/PREDICTION (What did you think you would find? Why?)

TEST (Briefly explain how you set up & tested your prediction.)

RESULTS (What did you find, when you performed your test?)

DISCUSSION (Are your results consistent with your initial hypothesis and prediction? Why or why not?)

CONCLUSION (What do these results mean, in a larger scope? Why should anyone become excited or interested in your findings?)

ABSTRACT WORKSHEET EXAMPLE

Below you will find an example of a completed abstract worksheet.

PROJECT TITLE
A Test of The Competitive Exclusion Theory in Two Related Species of Butterflies

INTRODUCTION
I examined the food habits of larval butterflies of two related species in a zone of overlap near Oil City, PA.

HYPOTHESIS/PREDICTION
The theory of competitive exclusion predicts that food habits of closely related species should not overlap significantly where the species occur together.

TEST
I used transects in five different habitats to determine food and habitat preferences in wild populations. Captive caterpillars were offered various foods in the laboratory; weight changes of foods and caterpillars were examined daily.

RESULTS
Food habits in overlap habitats were significantly different between the two species (ANOVA $p=0.001$). Food habits in non-overlap habitats were not significantly different (ANOVA $p=0.52$). Their were no differences in food preferences (ANOVA $p=0.76$) or growth rates (ANOVA $p=0.88$) on different foods in the laboratory populations.

DISCUSSION
These species are able to coexist because they are not competing for the same, and limiting, food resources in the same area.

CONCLUSION
These results support the theory of competitive exclusion because the tow species did not use the same food resources in the same habitats.

Formal Abstract Example

Specify the scientific field of research of your abstract, designating both the major scientific discipline and the sub-discipline, as per NJSHS categories.

Name: Sarah Dioski
Home Address: 135 Main Street
City, State, Zip: Oil City, PA 16215
School: Oil City High School
Sponsor/Teacher: Mrs. Georgiana Spallanzi
Title: A Test of The Competitive Exclusion Theory in Two Related Species of Butterflies

I examined the food habits of larval butterflies of two related species Papilio splendens and Papilio blanchii in a zone of overlap near Oil City, PA. The theory of competitive exclusion predicts that food habits of closely related species should not overlap significantly where the species occur together. I used transects in five different habitats to determine food and habitat preferences in wild populations. Captive caterpillars were offered various foods in the laboratory; weight changes of foods and caterpillars were examined daily. Food habits in overlap habitats were significantly different between the two species (ANOVA p=0.001). Food habits in non-overlap habitats were not significantly different (ANOVA p=0.52). There were no differences in food preferences (ANOVA p=0.76) or growth rates (ANOVA p=0.88) on different foods in the laboratory populations. These species are able to coexist because they are not competing for the same and limiting food resources in the same area. These results support the theory of competitive exclusion because the two species did not use the same food resources in the same habitats.

Abstract Form for National JSHS Student Participants

Abstracts prepared by the student finalists attending the National JSHS will be published and distributed at the symposium. Submitted abstracts are not edited; therefore, students should carefully review and edit their own work. Make sure the abstract is clearly and concisely written, and correct mistakes in punctuation, grammar, spelling and typing.

A good abstract is written to summarize the research paper. The abstract should accurately convey the essential nature of the research conducted and the most significant conclusions reached. For the National JSHS, a further purpose of the abstract is to attract the interest and curiosity of the non-specialist reader and thus encourage exchange, discussion and elaboration between various authors and between authors and readers.

Instruction: Abstract must be in typewritten form, standard 12 point style, and must be single-spaces. The Courier 12 type style is recommended. If any diagrams are used, draw in black ink. The abstract should be adequate in length but not exceed 175 words.

Abstracts must be submitted on the form herein provided (page 18). Do not submit a photocopy. Type within the 4-corner frame.

Example of 100-word Abstract

BEST COPY AVAILABLE

Name: Glick, Gary
Home Address: 20 Surrey Road, Somerset, NJ 08873
School: Franklin Township High School
Sponsor/Teacher:
TITLE: Characterization of Medieval Window Glass by Neutron Activation Analysis

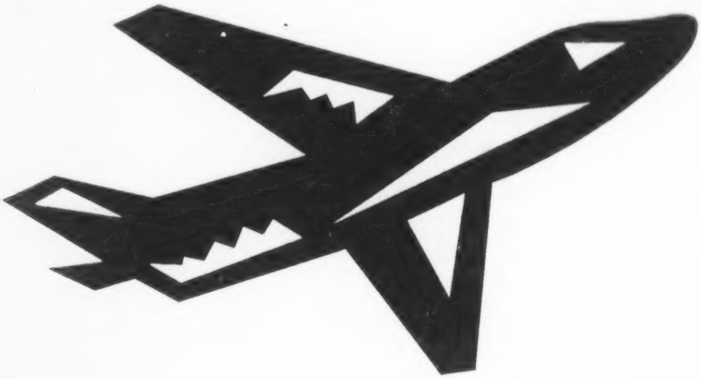
The concentration of 15 component oxides in medieval stained glass were determined by instrumental thermal neutron activation analyses. Three groups of glass were studied: 52 specimens from a set of 13th century French grisaile panels from a demolished royal chateau to Rouen: 10 samples from a grisaille panel in the collection of the Princeton University Museum of Art; and a set of 32 random fragments from varied provenance.

Significantly differing compositions were found. However, specimens from within individual and related groups of panels are compositionally similar even for different colors of glass, indicating a common origin for the related pieces.

Example of 175-word Abstract

Name: Kornfeld, Stephen Kerry
Home Address: 50 Villa Coublay, Frontenac, Missouri 63131
School: Horton Watkins High School
Sponsor/Teacher: Charles Smith
TITLE: A Determination of the Oligosaccharide Binding Specificity of Lecithins from Pisum sativum and Lens culinaris

Lecithins agglutinate red blood cells by binding to cell surface glycoproteins. The lecithins recognize and bind to the sugar portions of the glycoproteins. Because different lecithins are specific for different sugar sequences, lecithins are useful tools for fractionating and isolating glycoproteins. This study was to determine the precise oligosaccharide binding of pea (Pisum sativum) and lentil (Lens culinaris) lecithins. The lecithins were covalently bound to an insoluble support, Sepharose, which is suitable for affinity chromatography. A variety of radioactively labeled glycopeptides with different oligosaccharide structures were tested for binding to the lecithin affinity columns. The conclusion is that affinity binding to the pea and lentil lecithins requires at least two α-linked mannose residues that are not substituted at positions 3, 4, or 6 as well as the fructose residue. While the mannose and fructose residues are essential for high affinity binding, neither sugar residue by itself is sufficient for binding. With this information, these two lecithins can become useful tools for fractionating the glycoproteins of animal cells.



Specify the scientific field of research of your abstract, designating both the major scientific discipline and the sub-discipline, as per NJSHS categories

Name:
Home Address:
City, State, Zip:
School:
Sponsor/Teacher:
TITLE:

Abstract Form for National JSHS Student Participants

Abstracts prepared by the student finalists attending the National JSHS will be published and distributed at the symposium. Submitted abstracts are not edited; therefore, students should carefully review and edit their own work. Make sure the abstract is clearly and concisely written, and correct mistakes in punctuation, grammar, spelling and typing.

A good abstract is written to summarize the research paper. The abstract should accurately convey the essential nature of the research conducted and the most significant conclusions reached. For the National JSHS, a further purpose of the abstract is to attract the interest and curiosity of the non-specialist reader and thus encourage exchange, discussion and elaboration between various authors and between authors and readers.

Instruction: Abstract must be in typewritten form, standard 12 point style, and must be single-spaces. The Courier 12 type style is recommended. If any diagrams are used, draw in black ink. The abstract should be adequate in length but not exceed 175 words.

Abstracts must be submitted on the form herein provided (page 18). Do not submit a photocopy. Type within the 4 corner frame.

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CHAPTER TWENTY-THREE
RESEARCH PAPER WRITING AID

HOW TO PREPARE A RESEARCH PAPER

Scientists frequently communicate the results of their work in research reports. They tell others **what** study they performed, **why** they did it, **what** they discovered, and **what** it means. Regardless of the specific discipline involved, **all research reports follow a general format:**

Title
Introduction
Materials and Methods
Results
Discussion
Conclusions
Acknowledgements
Literature Cited
Appendices, (if necessary)

The sections are described below. Each section should be clearly labeled. Your report should follow this format, be neatly typed (double-spaced), and carefully proof-read.

Title

Make your title **concise**, but also **descriptive** of your study. Your title should indicate the nature of your research. "Studies on slug slime" is not as descriptive as "Chemical constituents of slug slime".

Introduction

Why are you performing this experiment? What hypotheses are you testing? Based upon your reading on this topic, what results do you anticipate (and why)?

The introduction should address these and similar questions. To tackle the third question, some literature research will be necessary. If you include information from other sources to explain what is currently known about the topic and why you are anticipating certain results, **be sure to cite those references in text** (see "Literature Cited" section of these instructions).

Be careful not to fall into the trap of believing that all research must have world-shaking consequences to the human race. That certainly is not true. You may be simply investigating a small facet of the life history of some creature. If so, don't fabricate a story simply to "justify" your work.

Materials Methods

How did you conduct your study? **What equipment** did you use? **What procedures** did you follow?

Relate your procedures in **sufficient** detail that someone else (or you!) could repeat the experiment. Species of organisms studied **may** be important (depending upon the type of study); the level of precision of your instruments is certainly important to mention here. Since your procedures have been completed, **report them using past tense**. Instead of saying "Add 2 ml of water, then mix and add..." say "I **added** 2 ml of water, **mixed**, and **added**...".

Results

What did you find? Present the results of your research in a logical order. Use tables and figures (graphs) to aid your reader to visualize your results readily. Tables and figures need to be numbered separately. This will enable you to refer to them in text quite easily ("Table 3 shows that putrifaction..."). They also need a descriptive caption to aid the reader in deciphering what is supposed be seen in that particular table or figure. Even though you may present your results in a table or figure, be certain to **explain in text** the important features of each one. If a trend is indicated in a figure, point out that trend to your reader. This is the appropriate place to report the results of statistical analyses of your data. Be sure to report the type of statistical test, the numerical value, and the p value. "I found a significant difference between the groups ($t = 27.6$, $p = 0.001$)." **DO NOT INTERPRET your results in this section**. That comes next!

Discussion

What do your results mean? In this section, you should interpret your results. Are your data consistent with your initial hypothesis? Do you need to revise your hypothesis? How do your results compare with the results of other scientists performing similar experiments? What main conclusions can you draw from the results of your experiment? If there are ambiguities in your results, what further experiments need to be performed?

Conclusions

What do you conclude, based upon your work and your reading of this topic? Please wrap up your report with a brief set of conclusions.

Acknowledgements

You should acknowledge those who assisted with your study: financial supporters, teachers, peers, scientists, proofreaders, typists, etc. Keep this section brief, but be sure to identify major contributions. "I thank Backwoods Paper Company for needed supplies, research space, and advice..." " I thank the following for advice and guidance: Mr. James Sprague (my teacher), Ms. Joy Adams, Mr. Tod Reed, and Ms. Rita Iretowsha (fellow students)."

Literature Cited

Whenever possible, you should compare your results with those of other scientists. This will permit you to augment your limited time with results from similar experiments. When you refer to the results of another scientist in your paper, **you must indicate the source** of that information. That way, someone reading your paper will realize that the information comes from another project. Also, the reader may wish to examine other experiments, such as the one you used. Failure to cite the work of another scientist (that you used in text) results in a serious offense (plagiarism) that is akin to stealing and is severely frowned upon. Therefore, all information that is not from your experiment, and is not "common knowledge", must be acknowledged by a citation. **All literature cited in text must be listed in your Literature Cited section.**

The preferred method of **citing a reference in text** in most scientific papers is: "Campbell (1975) saw gulls driving incubating females from their nests." This can also be written as: "Gulls have been observed to drive incubating females from nests (Campbell 1975)." All you need to cite **in text**, therefore, is the **author's last name and the year of the publication** (not the year the study was conducted!). If there are two authors, the citation should be: (Dwernychuk and Boag 1972). When there are three or more authors, give the name of the first author in the following form: (Divoky et al. 1974).

The most common method of listing articles cited in your paper is to place them in a "Literature Cited" section at the end of the paper. **References should be listed in alphabetical order, according to the first author's last name.** All references (whether a book, an article from a book, a journal article, etc.) should be lumped together before you alphabetize: **do not** make separate lists for books, theses, etc. References should be listed "flush left" (all the way to the left margin). If they require more than one line, then additional lines must be indented five spaces. Double-space **between** references.

The following example should be helpful:

LITERATURE CITED

Anderson, R. M. 1913. Report of the natural history collections of the expedition. Pp. 436-527 In V. Stefansson. My life with the Eskimo. Macmillan. N. Y.

Bergman, R. D. 1974. Wetlands and waterbirds at Point Storkersen, Alaska. Ph.D. diss. Iowa State University, Ames, IA.

Hulten, E. 1968. Flora of Alaska and neighboring territories. Stanford University Press. Stanford, CA.

Larson, S. 1960. On the influences of the arctic fox Alopex lagopus on the distribution of arctic birds. Oikos 11:276-305.

Appendix

In some cases you may wish to include large tables of raw data in your report. It is not appropriate to clutter the Results section with this material. You may include such items in an Appendix at the very end of your research report. If you have more than one set of materials to include, give each a number: Appendix 1, Appendix 2, etc.

CHAPTER TWENTY - FOUR
RESEARCH PROPOSAL ORGANIZATION

Research proposal information including the required proposal organization is provided in Chapter Six.

NOTES

CHAPTER TWENTY-FIVE
RESEARCH PAPER AND PROPOSAL TYPING & PRINTING INSTRUCTIONS

PAPERS:

- **Body Of The Paper**. To be acceptable, papers must be double spaced [**except abstracts**]. Papers that are not printed, double spaced are not acceptable. Research papers that are not double spaced when they are submitted will be presented in poster sessions only. These research papers will not be considered for presentation in formal presentation sessions.
- **Abstract**: Abstracts are typed and single spaced. They are printed on the JSHS abstract form or a copy of the abstract form. It is provided elsewhere in this publication. Abstracts not printed on the form provided, not single spaced or not adhering the space allocation provided by the form are not acceptable. Research papers whose abstracts are not constructed accordingly will be presented in poster sessions and not considered for presentation in formal presentation sessions.

RESEARCH PROPOSALS: To be acceptable, research proposals must be printed double spaced. Proposals that are not printed double spaced are not be acceptable and will be returned to their authors' for correction.

NOTES

CHAPTER TWENTY-SIX
RESEARCH PAPER AND PROPOSAL SUBMISSION INSTRUCTIONS

SUBMISSION DEADLINE: Research papers and proposals should be mailed so they arrive in Japan on or before 15 January. Papers that arrive later than 15 January will not be considered for formal presentation. The authors of papers which arrive after the deadline will present their research results in poster sessions.

SUBMISSION ADDRESS: Send one completed copy of the research paper to:

Assistant Director
Junior Science And Humanities Symposium
District Superintendent of Schools, Japan
DOD Dependents Schools, Pacific
Unit 5072
APO AP 96328-5072
ATTN.: Takashi Suyama

Telephones:
DSN 225-3940/3941/3946/3947
Commercial 81-0429-52-2511-5-....

FAX
DSN 225-3952
Commercial 0425-30-1402

NOTES

CHAPTER TWENTY-SEVEN
JUDGING GUIDELINES - RESEARCH PROJECTS, PAPERS, PROPOSALS AND ORAL PRESENTATIONS

RESEARCH PROJECTS, PAPERS AND ORAL PRESENTATIONS [Grades 9-12]:

- **First Evaluation**: The first evaluation of a research project is accomplished by the student's mentor. The mentor must decide whether the student conducted an acceptable research project, whether the project was conducted at an acceptable level of sophistication, and to the standards set by the mentor when the project started.

- **Second Evaluation**: The second evaluation is accomplished by the school JSHS Coordinator. The coordinator examines the research paper for the criteria listed below. When a school JSHS coordinator submits a student's research paper the coordinator is certifying that the student has completed research work acceptable in the JSHS program.

    - Determine that the paper describes a research project and not a library project.

    - Determine that the research paper includes the following: Abstract, Introduction, Methods and Materials, Findings, Discussion, Conclusions, Limitations of the Study, Suggestions for Further Research, Literature Cited. If the research paper does not include those sections, the student researcher should be directed to do additional work on the paper.

- **Third Evaluation**: All research papers received by the District Superintendent of Schools, Japan are scanned for proper format and general quality. In order to be forwarded to the JSHS formal presentations selection panel, a research paper must: [1] contain the following sections; Abstract; Introduction; Methods and Materials, Findings, Discussion, Conclusions, Limitations of the Research,, Recommendations for Further Research, Literature Cited; [2] contain adequately written research paper sections. A student submits a flawed paper when a research paper section contains but one sentence. Research papers that do not meet these criteria are automatically programmed for presentation at poster sessions. Papers that meet these criteria are forwarded to the PJSHS selection panel for further evaluation.

- **Fourth Evaluation**: All research papers complete as described above are evaluated by the research paper evaluation team. The evaluation criteria used are found on the research paper evaluation located at the end of this chapter. The evaluation team assigns each research paper a numerical score based upon the:
    - Quality of the experimental design.
    - Originality of the project.
    - Breadth and depth of topic understanding displayed in the paper.
    - Quality of the research paper, including spelling, use of proper grammar and so on.

- **Fifth Evaluation [Symposium Presentations]**: Grades 9-12 students who make formal presentations have their oral presentations judged in the areas listed below. As a result of the judging process each presentation is assigned a numerical score.
    - The quality of the experimental design.
    - The originality of the project.
    - The breadth and depth of topic understanding manifest by the oral presentation.
    - The quality of the presentation.

- **Judging Forms**: The forms used to judge research papers and the oral presentations are included at the end of this chapter.

- **Judging Results - Identification Of Top Student Researchers**: The numerical score from the written paper evaluation and the oral presentation are summed for each student to provide students' final scores. Students with the top three scores attend the National Junior Science and Humanities Symposium [NJSHS]. The student with the highest composite score [the number one student for the Region, makes a second oral presentation at the NJSHS].

RESEARCH PROJECTS, PAPERS AND ORAL PRESENTATIONS [Grade 8]: Grade 8 students are evaluated in the same manner as the grades 9-12 students. The only difference is that grade 8 students do not attend the NJSHS.

RESEARCH PROPOSALS [Grades 9 & 10]:

- **First Evaluation**: The first evaluation of a student's research project is accomplished by the student's mentor. The mentor must decide whether the student accomplished work on

- the proposal to an acceptable level and to the standards set by the mentor when the project started.

- **Second Evaluation**: The second evaluation is accomplished by the school JSHS Coordinator. The coordinator examines the proposal for the for the items listed below. When a school JSHS coordinator submits a students JSHS proposal the coordinator is certifying the student has completed all work to a level acceptable in the JSHS program.

    - The paper describes a research project and not a library project.

    - Determine that all required proposal sections are included. If the research proposal paper does not include those sections, the student researcher should be directed to do additional work on the paper.

- **Third Evaluation**: The third evaluation for research proposals occurs at the poster session to which the student is assigned. The evaluation form for research proposals is included at the end of this chapter.

SYMPOSIUM
RESEARCH PROPOSAL EVALUATION FORM

Name of Student:____

Research Proposal Title:____________________________________

Note! All items in the criteria column are evaluated both on the students poster and on his or her informal presentation. This form is used for both purposes.

POINTS	CRITERIA
Total [42]______________	**I. Quality of Research Design**
______	a. Is the problem well stated and delimited?
______	b. Are the variables identified?
______	c. Is there a recognition that measurements are limited?
______	d. Will there be sufficient data to support decisions that must be made?
______	e. Is the statistical analysis appropriate to the experience of the student researcher?
______	f. Is there evidence that an adequate literature search was conducted?
Total [26]______________	**II. Originality of Topic or Approach**
______	a. Is the topic suitable [gr. 9-10 research]?
______	b. Is there evidence that the majority of the work was accomplished by the student?
Total [32]______________	**III. Scientific Understanding Displayed**
______	a. Are significant details emphasized?
______	b. Is the researcher objective?
______	c. Are limitations of the study considered?
______	d. Will conclusions be based upon evidence?
TOTAL:______________	

Other Evaluator Comments:____________________________________

____

____

____

SYMPOSIUM
RESEARCH PAPER EVALUATION FORM

Research Paper Title: ______________________________

Student Registration Number: ______________________________

POINTS		CRITERIA
	42	I. **Quality of the Research Design**
		a. Statement and Delimitation of the Problem
		b. Identification of Variables
		c. Recognition of Measurement Limitations
		d. Adequacy of Data (amount)
		e. Appropriateness of Statistical Analysis
		f. Adequacy of the Literature Search
	18	II. **Originality of Topic or Approach**
		a. Suitable Topic for High School Research
		b. Personal Work Vs. Professional Help
		c. Degree of Originality
	30	III. **Scientific Understanding Displayed**
		a. Emphasis On Significant Vs. Trivial Details
		b. Degree of Objectivity
		c. Scientific Vs. Value Judgments
		d. Recognition of Limitations of the Study
		e. Conclusions Based On Evidence
	20	IV. **Quality of the Paper Itself**
		a. Title
		b. Abstract
		c. Introduction Section
		d. Methods and Materials Section
		e. Findings [including data] Section
		f. Discussion Section
		g. Conclusions Section
		h. Limitations of the Study Section
		i. Suggestions for Further Research Section
		j. Literature Cited Section
	Total Points	

Evaluator Comments: ______________________________

SYMPOSIUM
ORAL PRESENTATION EVALUATION FORM

Title of the Research Paper: ____________________

Name of the Researcher: ____________________

POINTS		**CRITERIA**
______	____50____	I. **Quality of the Research Design**
	________	a. Statement and Delimitation of the Problem
	________	b. Identification of Variables
	________	c. Recognition of Measurement Limitations
	________	d. Adequacy of Data (amount)
	________	e. Appropriateness of Statistical Analysis
______	____12____	II. **Originality of Topic or Approach**
	________	a. Suitable Topic for High School Research
	________	b. Personal Work Vs. Professional Help
	________	c. Degree of Originality
______	____50____	III. **Scientific Understanding Displayed**
	________	a. Emphasis On Significant Vs. Trivial Details
	________	b. Degree of Objectivity
	________	c. Scientific Vs. Value Judgments
	________	d. Recognition of Limitations of the Study
	________	e. Conclusions Based On Evidence
______	____33____	IV. **Quality of the Presentation**
	________	a. Title
	________	b. Introduction
	________	c. Methods or Procedures
	________	d. Data or Findings Display and Description
	________	e. Discussion
	________	f. Conclusions
	________	g. Limitations of the Study
	________	h. Suggestions for Further Research
	________	I. References Made to Other Research
	________	j. General Clarity of Expression
	________	k. Use of Visuals NA/Adequate/Excessive
______	**Total Points**	

Evaluator Comments: ____________________

CHAPTER TWENTY-EIGHT
ASSIGNMENT OF JUDGES

FORMAL PRESENTATIONS: Judges are drawn from a variety of sources. All individuals who serve as judges are volunteers. The sources include:

- Universities
- U. S. Army, Navy, and Air Force Bases and Research Offices.
- U. S. Embassy, Tokyo, Japan
- Department of Defense Dependents' Schools
- NASA
- Others

POSTER SESSIONS: School JSHS sponsors who accompany students to the Symposium serve as poster session judges. Judging assignments are made during the Symposium is organization period.

NOTES

CHAPTER TWENTY-NINE
ORAL PRESENTATION SEQUENCE

MASTER OF CEREMONIES OR SESSION MODERATOR: Oral presentation sessions are managed by one of two people: the Symposium Master of Ceremonies or the presentation session moderator.

SEQUENCE:

- **Presentation Order**: The order in which students make presentations is assigned randomly. Student presentation session number and presentation order are posted prior to the Symposium. The session number and presentation order are provided to all Symposium participants prior to the beginning of the Symposium.
- **Master of Ceremonies or Moderator**: Introduces the presenting student to the audience and provides the audience with the title of the research paper.
- **Presenting Student**: Makes his or her presentation.
- **Session Timer or Moderator**: Informs the presenter when three minutes of presentation tie remain and when the presentation time limit has been reached.
- **Master of Ceremonies or Moderator**: Provides the audience with the rules for the "Question and Answer Period." The audience is instructed about what types of questions are appropriate to ask the presenter and the amount of time allowed for the question and answer period [grades 9-12 - 10 minutes; grade 8 - 5 minutes]. Also, the presenter is told to repeat each question from the audience before providing an answer as follows: The question was........
- **Presenting Student**: Answers questions, first from the judges and then from the general audience.
- **Session Timer or Moderator**: Times the session and informs the audience when the allowed Q & A period has elapsed.

NOTES

CHAPTER THIRTY
ORAL PRESENTATION STUDENT GUIDANCE

PREPARATION: Students often become nervous when they must face an audience. Because of nervousness, students' presentations often turn out poorly. This problem may be solved by having students conduct practice presentations. Practice sessions should be made to a group of student friends. When possible, practice presentations are video taped. Once a presentation has been taped, a student should:

- **Viewing** View the taped presentation.
- **Student Suggestions**: Ask student friends to view the taped session, and suggest ways the presentation can be improved.
- **Adult Suggestions**: Have mentors, sponsors, coordinators, and teachers view the taped session and make suggestions for improvements.
- **Repeats**: For the best possible results, this process should be repeated several times.

USE OF VISUAL AIDS: Slides, overhead projections, and computer projections may be used during oral presentations.

- **Computer Power Point Use**: The Power Point program or a similar program sometimes helps to speed presentations and make them better. Power Point, however, in keeping with National JSHS policy may not take more that **a total of two minutes** of the allotted 15 minutes presentation time. Students using Power Point or a similar program should also examine the other guidelines for the use of visual aids.
- **Viewing Visual Aids**: Visual aids must be easily readable at the back of a large lecture hall. Students sometimes fail to look at projection size before they make a presentation. Often the printing on the aid cannot be read by most of the audience. As a rule, regular size typing used on the overhead projector, even when magnified by some projection factor, is too small to be read by distant viewers. Visual aids that cannot be read by every one in the audience detract from the presentation.
- **Numbering Visual aids**: Visual aids should be numbered and listed by title on a separate sheet of paper from the rest of the presentation. Using this procedure helps a presenter find the visual aid quickly, and easily if it becomes necessary to show it again.

- **Visual Information**: Visual aids should be simple. Students sometimes include too much information in a visual. It is better to use two visual aids when a great deal of information must be displayed for an audiance. When data are displayed, an entire data set should not be made into a visual aid. Rather, the visual should display only a summary of the data.

TIME ALLOWED FOR PRESENTATIONS:

- **Grades 9-12**: Grades 9-12 students are allowed 15 minutes for formal research paper presentations. At the end of the 15 minute period, a presenter must stop even though the presentation has not been completed.
    - ***Warning***: The session timer gives the presenter a three minute warning after 12 minutes of the presentation time have passed. This is accomplished when the timer hold three fingers in the air so the fingers can be seen by the presenter This is the signal to the presenter that 3 minutes of presentation time remain.
    - ***Stop Signal***: At the end of the 15 minute period, the session timer notifies the student that the presentation period is over.
    - ***Question and Answer Period***: At the conclusion of the presentation, the audience is allowed 10 minutes to question the presenter. During the period, anyone is free to ask questions about any aspect of the research they wish. Questions not related to the research are not allowed. When an unacceptable question is asked, the presenter should respond by saying, "That was not part of my research project."
- **Grade 8**: Grade 8 students are allowed 12 minutes to make formal research paper presentations. At the end of the 12 minute period, a presenter must stop even though the presentation has not been completed.
    - ***Warning***: The session timer gives the presenter a three minute warning after 9 minutes of the presentation time have passed. When it is time for the warning, the timer holds three fingers in the air so the fingers can be seen by the presenter. This is a signal to the presenter that 3 minutes of the presentation time remain.
    - ***Stop Signal***: At the end of the 12 minute period, the session timer notifies the student that the presentation period is over.

- ***Question and Answer Period***: At the conclusion of the presentation, the audience is allowed 5 minutes to question the presenter. During the period, anyone is free to ask questions about any aspect of the research they wish. Questions not related to the research are not allowed. When an unacceptable question is asked, the presenter should respond by saying, "That was not part of my research project."

NOTES

CHAPTER THIRTY-ONE
POSTER SESSIONS

GENERAL: Poster sessions are held the morning of the first day of the Symposium.

POSTER SESSION PARTICIPANTS:

- **Research Project Students**: All students not scheduled to make formal research paper presentations are expected to present the results of their research in one of the poster sessions.
- **Research Proposal Students**: All research proposal students who attend the symposium are expected to make poster presentations.

POSTERS: Posters present summaries of research projects. Posters must adhere to the following guidelines.

- **Size**: Posters must be no larger than **one meter by one meter**. *They shall not have side wings or other paper structures that extend over the edges of the poster*.
- **Composition**: A poster should summarize a research project, showing, in the most vivid way possible, the important aspects of the research project or proposal. They should include:
    - *Title*: Research Project Title.
    - *Author*: Researcher's Name.
    - *Methods*. Research methods used during the project should be included.
    - *Results*. Results should be presented using photographs, Figures, Tables, and a minimum of text. Research proposal writers should include their expected results.
    - *Conclusions* The conclusion(s), being perhaps the most important part of the research, should be presented, and related to the project findings. The amount of verbiage used on the poster should be limited and written in clear, correct, standard English.
- **Color**: Intelligent use of color makes the difference between a monotonous display and one that says, *"for something interesting, come over here."*
- **Crowding**: Constructing posters which are crowded with too much information must be avoided. To help avoid crowding, students should give interested individuals a copy of their research paper abstract. It is impossible to force all possible information about a research project on one poster!

- **Evaluation**: Posters are evaluated by sponsors who serve as judges. Top poster session students are recognized during the Symposium Awards Ceremony. A Poster Session Evaluation Form is included at the end of this chapter

POSTER SESSION LENGTH:

Poster sessions are one hour long.

POSTER SESSION PROCEDURES:

- **Location**: Each student presenting a poster is assigned to a session. Poster session locations are announced in the Symposium Schedule of Events. The schedule is provided to each participant at the Symposium Registration Desk.
- **Session Activity**: During the session to which a student is assigned, he or she is expected to make mini-presentations about the research project outlined by the poster.
- **Free Time**: Students are expected to attend all poster sessions. When students are not assigned to a session, they are expected to visit with other poster session presenters and learn as-much-as possible about those students' research.
- **Formal Research Paper Presenters**: Formal research paper presenters attend all poster sessions.

SYMPOSIUM
POSTER SESSION EVALUATION FORM

Researcher's Name: ____________________

Researcher's Symposium Registration Number: ____________________

Evaluator's Symposium Registration Number: ____________________

SCORING KEY

0 = Missing, 2 = Satisfactory, 1 = Unsatisfactory, 3 = Excellent, 4 = Outstanding

EXPERIMENT

- evidence of originality ____________
- evidence of independently developed procedures ____________
- isolation of variables ____________
- control of variables ____________
- use of appropriate statistics ____________
- sufficient data collected ____________
- data supported conclusions ____________
- statement of limitations provided ____________

SUBTOTAL I_____

POSTER

- problem hypothesis clearly stated ____________
- displayed data easily interpreted ____________
- pictures/drawings/outline of procedure ____________
- conclusion/s correspond to problem/hypothesis ____________
- technical aspects met: size IM x IM/color/spacing ____________
- relevant non-repetitious material displayed ____________

SUBTOTAL 2____

PRESENTATION

- abstract provided ____________
- clear summary of procedures ____________
- referred to relevant literature ____________
- provided suggestions for further research ____________
- discussed conclusions ____________
- interpreted relevant statistical tests ____________

SUBTOTAL 3____

SUBTOTALS: [1]____; [2]____; [3]____ ; **TOTAL SCORE** ____________

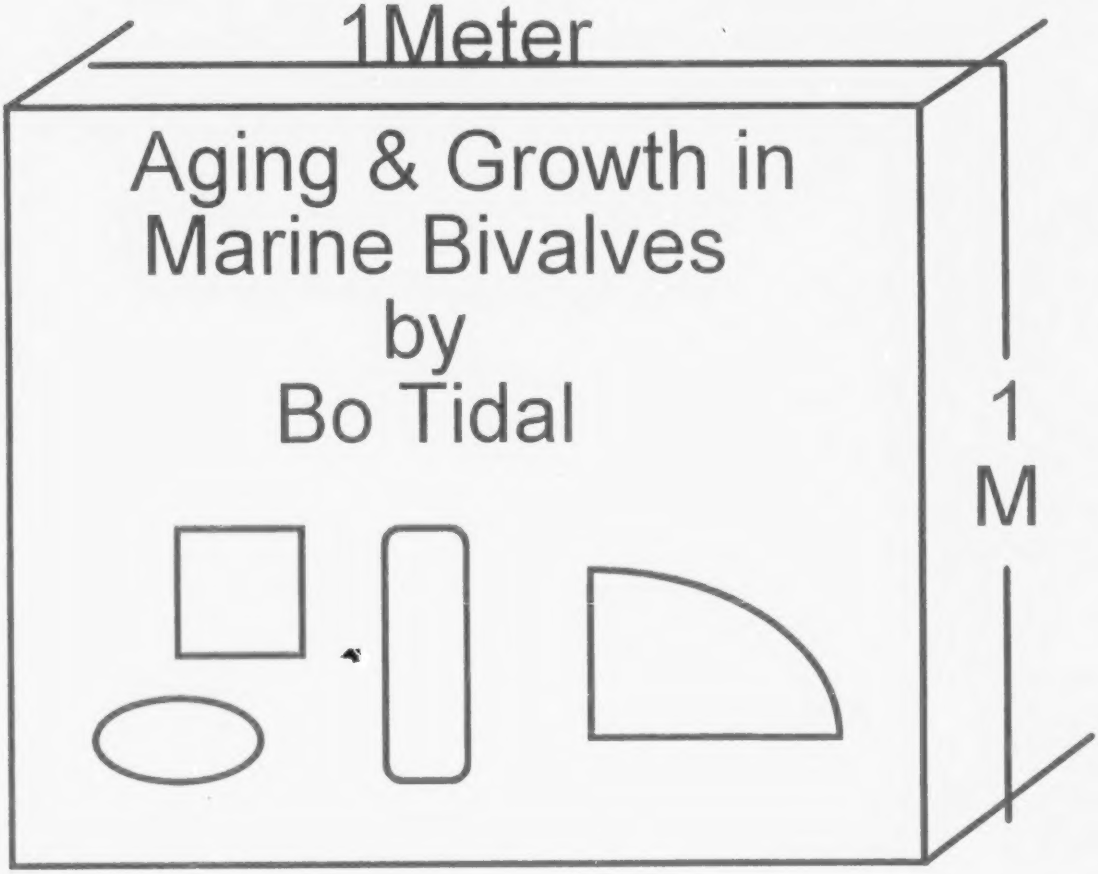
Evaluator Comments:____

____

____

Example Poster

Posters should be constructed using a flat piece of cardboard that can be taped to a wall. Science fair poster stands are not acceptable.


1Meter
Aging & Growth in
Marine Bivalves
by
Bo Tidal
1
M

CHAPTER THIRTY-TWO
TIME-LINE

BEGIN PROJECTS: ***January 1*** - of the spring prior to the year students desire to attend the symposium, they begin work on research projects.

SUBMIT APPLICATIONS: ***December 15*** - students submit:

- Applications for Symposium attendance to the Regional Symposium Director.
- The $40.00 non-refundable application fee to the Pacific Region Symposium Director.
- One copy of "Parental Permission for School Activity" DSP Form 105 or equivalent to the school JSHS coordinator.

SUBMIT RESEARCH PROPOSALS AND PAPERS: ***January 15*** - Students submit a copy of their research paper or proposal to District Superintendent of Schools, Japan.

FORMAL PRESENTATION NOTIFICATION: Notification of students selected to present research papers in formal sessions is usually made by ***1 March***.

REGIONAL SYMPOSIUM: ***March/April*** - Regional JSHS, Tsukuba City, Japan.

NATIONAL SYMPOSIUM: ***April/May*** - U. S. National JSHS.

INTERNATIONAL SYMPOSIUM: ***July*** - International Youth Science Forum, London, United Kingdom.

NOTES

CHAPTER THIRTY-THREE
REQUIRED SYMPOSIUM APPLICATION FORMS

STUDENTS' AND SPONSORS' APPLICATION FORMS: Copies of sponsor and student application forms are included at the end of this chapter. Xerox copies of the form should be made to meet the needs of a schools. All attending students and sponsors must submit application forms.

PARENTAL PERMISSION FORM: Parental permission, must be obtained before a student can attend the Symposium. Permission to attend is granted when a participants' parents complete, "Parental Permission for School Activity," DSP Form 105 or equivalent and the completed form is returned to the school JSHS coordinator. Completed parental permission forms shall be retained by the respective schools.

NOTES

PACIFIC REGION JUNIOR SCIENCE AND HUMANITIES SYMPOSIUM
STUDENT APPLICATION

DIRECTIONS

- Provide a complete answer in each blank.
- Forward with a check in the amount of $40.00, payable to the Pacific Region Junior Science and Humanities Symposium with the application form, to:

Director, Pacific Junior Science and Humanities Symposium
DoDDS Box 112
Unit 15549
APO AP 96205-0005

- Print your name.
- Applications should arrive at the address provided below not later than 15 December.

Name:

Social Security Number:

Grade:

Sex:

School Name:

Home Mailing Address:

Home Telephone Number:

JSHS Mentor's Name & Signature:

JSHS Sponsor's Name & Signature:

Principal/Asst. Principal Signature:

PACIFIC REGION JUNIOR SCIENCE AND HUMANITIES SYMPOSIUM SPONSOR APPLICATION

DIRECTIONS

- Provide a complete answer in each blank.
- Application should arrive at the address provided below not later than 15 December

Director, Pacific Junior Science and Humanities Symposium
DoDDS Box 112
Unit 15549
APO AP 96205-0005

Name: ______________________________

Sex: ______________________________

School Name: ______________________________

Home Mailing Address: ______________________________
____

Home Telephone Number: ______________________________

Number of Students You Anticipate Bringing From Your School: ______________

School Administrator's Signature: ______________________________

CHAPTER THIRTY-FOUR
ACCEPTANCE OF STUDENT PARTICIPANTS

RESEARCH PROJECT STUDENTS: The following selection criteria are used to select students who will attend the Symposium:

- Successful completion of a high quality research project an associated report.
- Submission of a research paper on or before the published deadline listed in this publication.
- Submission of an application to attend the Symposium and associated payment of the application fee.
- **Maintenance of an acceptable GPA [minimum 2.0 with grades of "C" or better in all courses the previous semester] by the student applicant.**

Determination of whether or not a research project, and research paper meet acceptable standards is based upon the guidance provided in this document. The evaluations of a student's research project and research paper are made by the student applicant's mentor or through some other process established by the school. Once a research project and the research paper are deemed acceptable by school personnel school, the student may attend the Symposium.

RESEARCH PROPOSAL STUDENTS: Ninth and tenth grade research proposal students are accepted for attendance at the Symposium based upon the following criteria:

- Successful completion of a research proposal.
- Submission of the research proposal on or before the published deadline listed in this publication.
- Submission of an application to attend the Symposium and associated payment of the application fee.
- **Maintenance of an acceptable GPA [minimum 2.0 with grades of "C" or better in all courses the previous semester] by the student applicant.**

Research proposal quality is determined by a student's mentor. Once a research proposal has been deemed acceptable, that student may attend the Symposium.

OBSERVERS: From time-to-time student observers are invited to attend the Symposium.

CHAPTER THIRTY-FIVE
TRAVEL

TRAVEL ORDERS

♦ **Sponsors**: Sponsors' TDY orders [DD Form 1610] are issued in accordance with school and district policies. Orders shall include the following statement in block 16 of the form [Request And Authorization For TDY Travel of DOD Personnel];

> **"Limited per diem of $3.50 per day is authorized from 1500 hours, [insert a date here] Sunday through 1200 hours, [insert a date here] Thursday. Full per diem is authorized for the remainder of the temporary duty period."**

Use of a commercial foreign flag air carrier, may be authorized by the unit charged with preparing travel orders. Rail and bus transportation may be used. The Far East Tournaments TDY Funding Document or equivalent should be used to obtain the fund citations for Symposium travel and per diem.

♦ **Students**: Travel orders similar to those used for student travel to athletic events shall be issued to student Symposium participants.

TRAVEL DIRECTIONS

♦ **Yokota Air Base Arrival Times**: Yokota Air Base Air Mobility Command [AMC] terminal tentative arrival times, flight numbers, and arrival dates for personnel traveling via AMC aircraft to attend JSHS must be sent to District Superintendent of Schools [DSO] Japan. Arrival messages may be sent via telephone, FAX or CCMail to the JSHS assistant director. The relevant numbers and addresses are:

- Telephone - DSN 225-3940/3941/3947; commercial (81 country code) 0425-52-2511 plus the last five digits of the DSN telephone number.
- FAX - DSN 225-3952.
- CC Mail - Takashi Suyama

♦ **Arriving Junior Science And Humanities Symposium Participants:** A Department of Defense Dependents Schools, Japan District representative will attempt to meet all incoming AMC flights if the flight information requested in paragraph 1 of this section has been provided. If a flight is not met, the sponsor should call the Japan school district representative by telephone at (DSN) 225-3940/3941/3947.

- **Haneda Airport Tokyo Arrivals**: Arrival information for personnel flying to Haneda Airport should be forwarded to DSO Japan as described above for AMC arrivals. Instructions for travel to either Yokota Air Base or Tsukuba City will be arranged based upon the arrival information.

- **Narita Airport Tokyo Arrivals**: Arrival information for personnel flying to Narita Airport should be forwarded to DSO Japan as described for AMC arrivals. Transportation by bus to Yokota Air Base is available at Narita Airport. Arriving personnel who require transportation to Yokota Air Base may obtain bus travel information form the military representative at Narita Airport or the information counter outside of the customs area. Travel from Narita Airport to Tsukuba City by train is also available. Transportation by bus from Narita Airport to Tsukuba City will be provided to Symposium participants who arrive at Narita Airport on Sunday of the Symposium week. Directions regarding the bus location and pickup times on Sunday will be provided to school Symposium coordinators after their Narita arrival information is received by the Symposium Assistant Director.

- **Yokota Air Base Departure**: Buses will depart for Tsukuba City from the Yokota Officer's Club Parking lot at 1100 Sunday.

TRAVEL CLAIMS: All sponsors must file a travel claim, DD Form 1351, within five working days following the completion of travel. Travel claim forms are available using the "Filler" computer program installed on school computer networks. The forms are filed in accordance with local military base procedures.

NOTES

CHAPTER THIRTY-SIX
LODGING-MEALS-DRESS CODES

MEALS:

- **Students' Responsibility**: Students are responsible for all food costs incurred following their departure from home, and prior to the evening meal, Sunday of the Symposium week. Students are also responsible for purchasing their own meals, following the noon meal the day of departure from the Symposium until they arrive home.

- **Symposium Meals**: Food is provided free during the Symposium period. The food is Japanese style. There are many local establishments, close to participant lodging, where other types of food may be purchased. Food purchases are at an individual's own expense.

LODGING:

- **Early Arrival**: Symposium participants who arrive at Yokota Air Base prior to the Tsukuba City Sunday departure will be lodged at some Yokota Air Base location. It may be necessary at times to house travelers at one of the Yokota Air Base schools.

- **Late Departure**: Travelers departing Yokota Air Base Friday, Saturday or Sunday following the Symposium must make their own lodging arrangements.

- **Yokota Air Base Bachelor Officers' Quarters**: Sponsors and students who arrive early, may by billeted at the Yokota Air Base BOQ if space is available. BOQ reservations at the Yokota Air Base prior to departure for Tsukuba City are made by a DSO Japan representative. DSO Japan must be notified of arrival dates as early as possible so that adequate lodging space may be booked. For reference, the Yokota Air Base Billeting Office may be contacted by telephone at DSN 225-7326. BOQ expenses for students are not paid by the Symposium or from Department of Defense schools funds. Lodging costs BOQ are the responsibility of students.

- **Tsukuba City Lodging**: All Symposium participants are housed at the Tsukuba Training Center. Housing costs are paid from Symposium funds.

THINGS SYMPOSIUM PARTICIPANTS SHOULD KNOW ABOUT TSUKUBA CITY

- **Money**: It is difficult to convert dollars into yen! Symposium participants must plan to bring the yen they plan to spend with them to Tsukuba City.

Participants entering Japan from Korea or Guam can exchanged money at Narita Airport.

- **Towels**: The Tsukuba City Training Center, does not provide towels with the rooms. Participants must bring their own towels with them

- **Dress**:
  - **Students**:
    - ⇒ Dress-up for the annual Symposium reception.
    - ⇒ Dress-up during formal research paper presentations.
    - ⇒ Dress-up during poster presentations.
    - ⇒ Bring casual and cool weather clothing. It is not too late for snow in this part of Japan.

of Japan.

Dress for field trips is casual. Oversized bulky clothing, several sizes too large for the person is inappropriate wear for Japanese research institutes and for the Thursday evening social event. Students who persist in wearing such clothing will be restricted from attending Symposium events.

Sponsors: Be prepared to introduce students at various times during the Symposium.

Bring casual, and cool weather clothing.

Sleeping Rooms: Sponsors, and students have single rooms. Sponsors' rooms are on the same floors as the rooms of students.

Bath Rooms: A bathroom is located on each floor of the training Center.

Bathing Rooms and Style: The training center is set up in traditional Japanese style. There is a community bath and showers for men and a separate community bath and showers for women. Hot water is turned on only during specified hours. Those hours are announced at the beginning of the Symposium and are also posted.

Bathing Hours for Adults and Students: Bathing hours for adults and students are posted on the bathing room doors.

CHAPTER THIRTY-SEVEN
EXAMPLE SYMPOSIUM SCHEDULE

The Symposium normally is scheduled for a week. When funding shortfalls require the Symposium to be conducted for less than a week numbers of field trips will be limited to fewer than the number shown in the example schedule.

NOTES

Energy - Our Fusion Future

SEVENTEENTH ANNUAL PACIFIC REGION JUNIOR SCIENCE AND HUMANITIES SYMPOSIUM

SCHEDULE OF EVENTS

SUNDAY	***MARCH 22***
1100	Depart Yokota Air Base Officers Club
1500-1600	Register at the Tsukuba City Training Center
1800	***Dinner***
1900	Sponsors Meeting - Conference Room 1 Tsukuba Training Center
2300	Lights Out

MONDAY	***MARCH 23***
0700	***Breakfast***
0830-0930	Poster Sessions 1 [Conference RM 1], 2 [Conference RM 2], 3 [Training Center - First Floor]
0945-1045	Poster Sessions 4 [Training Center - First Floor], 5 [Conference RM 1], 6 [Conference RM 2]
1100-1200	Poster Sessions 7 [Conference RM 2], 8 [Training Center], 9 [Conference RM 1]
1200	***Lunch***
1300 - 1530	*Field Trip A* - **Building Research Institute**
	Field Trip B - **Forestry - Forestry Products**
	Field Trip C - **Lab of Metrology**
1800-2000	Stand-up Reception, Tsukuba Training Center
2100	Sponsors and Support Personnel Reception - Tsuskba Training Center, Conference RM 2
2300	Lights Out

TUESDAY	***MARCH 24***
0700	***Breakfast***
0830	Grades 9-12 Formal Presentation Session I - Biological Sciences - [International Hall]
0930 - 1100	*Field Trip D* - **Geology Museum**
	Guest Speaker [International Hall - 1000] - Dr. Howard Liljestrand, University of Texas, Austin
1200	***Lunch***

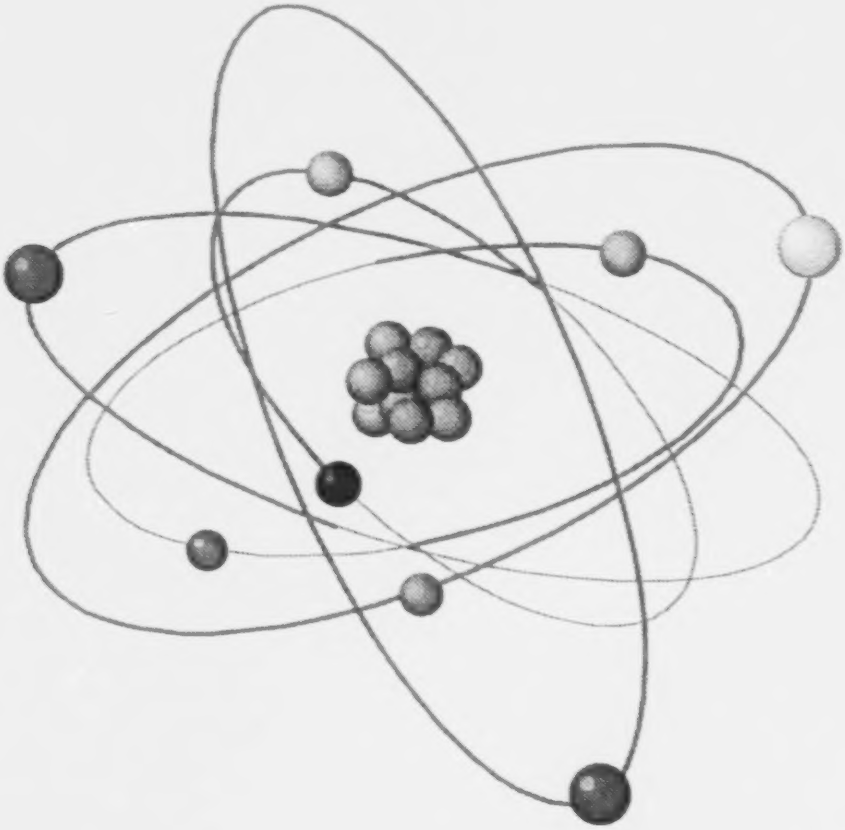
TUESDAY	***MARCH 24***
1300	Grade 8 Formal Presentation Session I [International Hall]
1400	Guest Speaker - Office of Naval Research, Tokyo, Japan
1245 - 1600	*Field Trip E* - **Institute of High Energy Physics [KEK]**
1330 - 1530	*Field Trip F* - **Institute of Inorganic Materials**
1630	Shopping Trip in Tsukuba City
1745	Sponsors Meeting [Tentative] to be Announced
1800	***Dinner***
2300	Lights Out

WEDNESDAY	***MARCH 25***
0700	***Breakfast***
0830	Grades 9-12 Formal Presentation Session II - Social Sciences - [International Hall]
0930-1130	*Field Trip G* - **Tsukuba Space Center**
1000	Keynote Speaker - Dr. Blinda Mcclend, University of Texas, Austin
1030	Grades 9 -12 Formal Presentations
1200	***Lunch***
1300	Grade 8 Formal Presentation Session II [International Hall]
	Field Trip H - **Environmental Studies Institute**
	Field Trip I - **Institute of Mechanical Engineering**
1400	Guest Speaker - U.S. Air Force Research Office, Tokyo, Japan
1730	Sponsors' Meeting [Tentative] to be Announced
1800	***Dinner***
1915-2100	Grade Eight Research Seminar With Jane Larson [Training Center Conference Room 2]
2300	Lights Out

THURSDAY	***MARCH 26***
0700	***Breakfast***
0830	Grade 9-12 Formal Presentation Session III - Physical Sciences, Mathematics & Engineering - [International Hall]
0930 - 1100	*Field Trip J* - **Maps and Survey Institute**
1000	Guest Speaker - U. S. Embassy Tokyo, Japan [Tentative]
1200	***Lunch***
1300-1600	*Field Trip K* - **Karate, Kendo, Judo**
	Field Trip L - **Karate, Kendo, Judo**
	Field Trip M - **Karate, Kendo, Judo**
1630-2100	Cultural Exchange Program - Ishige City
2300	Lights Out

FRIDAY	***MARCH 27***
0700	***Breakfast***
0900	Awards Ceremony [International Hall]
1130	Checkout of the Training Center
	Lunch
1200	Bus to Narita Airport
	Bus to Haneda Airport
	Bus to Yokota Air Base

** Meal times and departure times are subject to change.



CHAPTER THIRTY-EIGHT
FIELD TRIPS - ASSIGNMENTS AND MANAGEMENT

ASSIGNMENTS: Field trip assignments are made as follows.

- **Letters**: All field trips are lettered. The Tentative Schedule in the previous chapter shows field trips lettered successively from "A" through "M."
- **Database**: A computer database is used to track assignments.
- **Numbers**: When possible all participants are assigned to the same number of field trips.
- **Randomness**: Except for field trip monitors, assignments are made randomly, and no more than 50 people are assigned to a field trip.

MANAGEMENT:

- **Trip Tickets**: Tickets are provided for each field trip. The ticket for each trip includes the date, the day, the trip letter, the bus number, and the trip name of the. Tickets are provided to participants when they register for the Symposium.
- **Transportation**: Field trip buses are numbered 1, 2, and 3 and so marked. Field trip tickets are marked with the letter of the field trip and the bus going on that trip.
- **Trip Monitors**. Two school sponsors are assigned to each bus as field trip monitors. Monitors collect field trip tickets. To board a field trip bus, a participant must present the correct field trip ticket to a monitor. Trip monitors are responsible for determining that all participants have boarded a bus before it departs from the trip site to return to the lodging facility.
- **School Sponsors**: School sponsors are responsible for insuring that the participants attend all field trips to which they are assigned.
- **Bus Manager**: The bus manager is responsible for the movement of all buses. This person decides when the buses should depart for afternoon field trips. The movement of buses to morning field trips is the responsibility of the assigned Trip Monitors.
- **Trip Translators**: Each field trip includes a field trip translator. That person provides students an overview of the field trip during the trip to the trip site, meets site officials upon arrival at the trip location, and translates for students.
- **Trading Field Trips**: It is the sponsors decision as to whether their students are allowed to trade field trip tickets with other students. Students are not allowed to trade a trip on one day for a trip on another day. Students not assigned to a field trip at a given time are expected

to attend formal research paper presentation sessions. In order to board a bus regardless of its destination, a student must have a ticket for that bus.

- **Bus Capacity**: The capacity of buses used at the Symposium is 50 people. Buses containing more than 50 passengers cannot legally move. Bus ticket control, therefore, is extremely important.

NOTES

CHAPTER THIRTY-NINE
SYMPOSIUM RECEPTION SEQUENCE OF EVENTS

RECEPTION TIME: A Symposium General Reception is held for all participants between 1800 and 2000 the first evening of the Symposium.

RECEPTION LOCATION: The reception is held in the Tsukuba Training Center dining facility. An adults only reception is normally held in the in Conference Room 2 of the Tsukuba Training Center at 2100.

RECEPTION PURPOSE: The JSHS General Reception provides students and sponsors an opportunity to meet and socialize in an informal setting.

RECEPTION EVENTS: The reception events are conducted by the program master-of ceremonies.

RECEPTION DRESS: The General Reception is a dress-up function.

SEQUENCE OF EVENTS

TIME	EVENT	SPEAKER
◆ 1800	Welcome to the Symposium	MC
◆ 1810	Introductions	MC
•	Symposium Director	
•	Symposium Assistant Director	
•	Program Host	
•	Distinguished Visitors	
•	Judges	
1830	Introduction of Participants	MC & Individual School Sponsors by School
◆ 1845	Housekeeping Items	MC & Symposium Assistant Director
◆ 1850	Food and Conversation	All Participants
◆ 2000	Reception End	All Participants
◆ 2100	Adult Reception	

CHAPTER FORTY
SYMPOSIUM AWARDS CEREMONY SEQUENCE

MASTER OF CEREMONIES: The Awards Ceremony is conducted by the Master of Ceremonies. The following sequence is used.

♦ **Poster Sessions**: Poster session participants are the first students recognized. The Master of Ceremonies decides the number of students to be recognized, the sequence in which students are recognized and other details of this recognition process.

- The Master of Ceremonies is provided participant names and school names of a students who are to be recognized. This information is provided by the poster sessions tabulator.
- The sponsors of students to be recognized are called to the podium and given the names of students to be recognized.
- School sponsors call their students to the stage to receive recognition..
- Students are recognized by the Master of Ceremonies while the Symposium photographer takes pictures.
- Next sponsors of students not formally recognized call their students to the stage by school.
- Students are given certificates of symposium participation by the school sponsor.
- School group photographs are taken.
- As the students leave the stage they are provided additional awards of participation.

♦ **Grade Eight Formal Presentations**: Recognition is next provided to students of grade eight formal presentations.

- The same sequence, as was used for the poster sessions, is used here. The Master of Ceremonies decides the number of students to be recognized. At least three students are recognized as first, second and third place formal presenters in an order determined by the Master of Ceremonies.
- Following the presentations, all grade eight formal presenters and their sponsors participate in a photo session.

♦ **Grades Nine Through Twelve Formal Presentations**: Recognition of grades nine through twelve formal research paper presenters is made next.

- Four students are recognized as first, second, third, and fourth [fourth place is the runner-up] place presenters in reverse order.

- Following recognition of the first place student, scholarship certificates are presented by the Symposium Director and other scholarship donators.

- Following the presentations, all grades nine through twelve formal presenters and their sponsors participate in a photo session.

- **Recognition of Other Symposium Support People**: Other Symposium support personnel are recognized by the Master of Ceremonies and the Symposium Deputy Director.

CLOSING REMARKS: Closing remarks are made by the Symposium Director.

NOTES

CHAPTER FORTY-ONE
PACIFIC REGION JSHS STAFFING CHECKLIST

Management of the Pacific Region Junior Science and Humanities Symposium requires the following people by job title.

TITLE	NUMBER REQUIRED	JOB DESCRIPTION
Director	1	Overall Symposium Management
Programmer	1	Symposium Planning/Arrangements
Chief Translator	1	Symposium Arraignments
Translators	2	Field Trip Translation
Master of Ceremonies	1	Manage All Combined Sessions
Bus Manager	1	Control All Bus Movements
Bus-FT Monitors	2//FT	Collect Bus Tickets
Photographic Manager	1	Manage Symposium Photography
Sessions Photographer	26	Take Pictures at Various Sessions
Nurse	1	Help the Sick
Grade 8 Seminar Dir.	1	Design/Conduct Grade 8 Seminar
Grade 8 Seminar Sup.	5	Help Conduct Grade 8 Seminar
Keynote Speaker	1	Keynote Address
Guest Speakers	4-5	Provide Science Lectures
Judging Manager	1	Managing All Symposium Judging
Poster Judges	15	Judge Student Poster Presentations
Poster Ses. Tabulator	1	Tabulate Poster Session Judge Results
Formal Judges	10	Judge Formal Paper Presentations
Formal Ses. Tabulator	1	Tabulate Formal Session Judge Results
Housing Manager	1	Handle All Housing Issues
Transportation Manager	1	Arrange Transportation/Airport Pickups

NOTES

CHAPTER FORTY-TWO
NATIONAL JUNIOR SCIENCE AND HUMANITIES SYMPOSIUM INFORMATION

THE NATIONAL JUNIOR SCIENCE AND HUMANITIES SYMPOSIA PROGRAM

Program fact sheet and guidelines for students

SPONSORSHIP

The Junior Science and Humanities Symposia (JSJS) Program has been sponsored by the United States Department of the Army since its inception in 1958, and additionally joined by the Departments of the Navy and Air Force after 1995. Resulting from this sponsorship and the cooperative efforts of universities throughout the nation, JSHS annually reaches about 10,000 high school students and teachers at regional and national symposia. Forty-eight regional symposia are held throughout the United States, Puerto Rico, and in cooperation with the Department of Defense Schools of Europe and the Pacific. The annual National symposium culminates the program year and brings together 240 high school students, their teachers, university faculty and other educators and scientists.

The Academy of Applied Science, a non-profit educational organization in Concord, New Hampshire, administers the National JSHS Program in cooperation with universities or other educational institutions.

PROGRAM OBJECTIVES

The primary aims of JSHS are to promote original research and experimentation in the sciences, engineeting, and mathematics at the high school level, and to publicly recognize students for outstanding achievement. Each symposium, including forty-eight regionals and the national, provides a forum for high school students to present the results of their original research in the sciences, engineering and mathematics. Students who participate in the symposia have the opportunity to meet and exchange ideas, interact with practicing researchers, and explore future academic and career opportunities.

HOW STUDENTS PROGRESS TO NATIONAL

Any serious students in grades 9-12 with the potential or demonstrated interest in the sciences, engineering or mathematics is eligible to participate in a regional symposium. At the regional level, studebts are invited to prepare and submit a written report of their original research in the sciences, engineering, and mathematics. The written reports are reviewed by a regional panel of judges, who then select students to orally present the results of their research investigation to the regional symposium audience. The judging continues during the oral presentations which are made at the regional, selecting the finalists who will progress to the National symposium.

How to apply, the regional symposia. Typically in the fall, the regional symposia mail a call for papers to high schools within their geographic area. The call for papers invites schools to nominate students for participation and provides deadlines and instructions for submission of the written reports. Scheduling for the regional symposia varies, beginning as early as September through early April.

If your school has not received information on JSHS, please contact the director of the regional symposium in your area for application details.

The oral and written research reports. At both regional and national symposia, students prepare a written research report of their original research investigation in the sciences, engineering, or mathematics, and deliver a concise, oral presentation to the symposium audience. The written and oral reports should present the results of the student's own work. The report should include ideas and data obtained by the student. Students are encouraged to obtain assistance from teachers, mentors, parents, or other students. If outside assistance is obtained, it should be properly acknowledged and clearly stated. (See further guidance discussed under both "Judging criteria", and "Suggestions for writing the research paper.")

Eligibility - Team projects. Students should report on their individual contributions to research. If students are part of a larger group project, the presentation should focus again on the individual contributions in the larger

HOW STUDENTS PROGRESS TO NATIONAL (CONT'D)

Eligibility - Team projects (Cont'd). research project and properly acknowledge the contributions of other students, mentors, and/or teachers. For those team projects that cannot be divided into individual research projects, a team leader should be selected to present the results of the group project. In this case, all JSHS directives applying to individual projects will apply to group projects. In the event the group presenter of the winning regional group is unable to present at the National level, this opportunity will be passed on to the next ranking project not another member of the original winning group. This decision is made since the judges' evaluations and scores pertain to the individual presenter.

Eligibility - Scholarship awards. Students must be a citizen or permanent resident of the United States to be eligible for the government-supported scholarship awards.

THE NATIONAL SYMPOSIUM -- REQUIREMENTS FOR THE WRITTEN REPORTS

Abstract. Each of the 240 regional symposium finalists must submit a 175 word abstract. The abstracts are published in the National JSHS publication, "Abstracts of the Research Finalists." This publication is distributed to all symposium attendees. Students must submit the abstract on the attached "Abstract Form." This form provides instructions for the preparation of the abstract.

Research paper. Each of the 48 National paper presenters must submit a research paper. The research paper is used as a supporting document to the abstract during the judging process. The judges read both the abstract and paper. The paper should be a minimum of 5-6 pages and a maximum of 20 pages. The paper must be typed double-spaced on white paper, on one side only. Use black type. Tables, diagrams, charts, photographs, or other graphic representations should be done neatly and in black ink.

A recommended outline for the research paper includes: a cover page stating the student's name, school address, and title of the research; acknowledgement of major assistance received, table of contents; introduction; materials, methods and procedures used; results (data or findings); discussio and conclusions; literature cited; and appendices (if necessary). This is a recommended format, please follow any additional guidance or instructions from your advisors, including teachers, regional symposia directors, and others.

THE NATIONAL SYMPOIUM -- SUGGESTIONS FOR WRITING THE RESEARCH PAPER

Cover Page. The cover page states the student's name, school address, and title of the research. Make your title consice but also descriptive. Your title should indicate the nature of your research.

Acknowledgement of major assistance. Include a statement on where and when the research was done and acknowledge those who assisted you with the study.

Table of Contents. List the topics and sub-topics in order and the page numbers on which they start. Add to the table contents a list of all graphs, tables, and other representative figures. These should have a title and page number.

Introduction. A number of items are included in this section. Keep in mind though, you are writing the introduction to provide background, details, or the setting of your specific research problem. Presume that the reader will be scientifically literate, but he or she may not be familiar with the details. First in the introduction, state the purpose of the research study. Secondly, state the hypotheses that you are testing. Lastly, describe what is already known about the research as reported in relevant and referenced literature.

Materials, methods and procedures. State the materials, methods or procedures used to conduct the research in a step-by-step manner. This section should be written specifically enough so that the research could be replicated.

Results (Data or Findings). Present the results of your research findings in logical order. Use graphs, tables, and/or other representation. Tables and graphs should be numbered separately and include captions. Numbering will enable you to refer to them in text quite easily.

Results (Data or Findings) (Cont'd). Even though you may present your results in a graphic form, you must explain in text the important features of each table, graph, etc. This is also the appropriate place to report the results of statistical analyses of your data. Remember to report the type of statistical test used.

Discussion and Conclusions. You interpret your results in this section. First, restate your hypotheses, and explain how your data either supported or rejected your initial research question. Discuss your research findings in relationship to what is already known about the research problem (reported in the introduction section). Draw conclusions based upon your research findings (as reported in the results section).

Acknowledge any limitations which effect the research results. For example, what further experiments need to be performed? Statistical techniques used to manipulate the data may have limitations. Some of the treatment effect might have been caused by a random, uncontrolled intervening variable. Again, acknowledge these limitataions and other factors over which the researcher had no control, and state how these might have influenced the study outcomes.

Literature cited. This is a list of citations for every article cited in your text. Endnotes are needed for all direct quotations and for all important statements of facts or opinions that are taken from written sources. Figures, dates descriptions of situations, scientific data, opinion, representations and the like which are pesented to advance the subject of the paper need a stated source. Check with your teacher or other advisors if you need further advice about the format for endnotes.

Appendices. In some cases, you may wish to include large tables of raw data in your report. You should include such items in an appendix at the very end of your research report. Label and paginate your appendices.

DEADLINE - SUBMISSION OF THE ABSTRACT AND PAPER, NATIONAL

Each of the forty-eight National student presenters must submit the abstract and paper to the National JSHS Office, 98 Washington St., Concord, NH 03301, prior to *April 3, 1998*. If the regional symposium occurs after April 1, the regional symposium director and/or student must contact the National JSHS Office to coordinate an acceptable submission date.

The original and three copies of both the abstract and paper are required. Student presenters should plan to keep one copy, since the National JSHS Office cannot return the original papers.

THE NATIONAL SYMPOSIUM - REQUIREMENTS FOR THE ORAL PRESENTATIONS

Timing. The research presentation may not exceed 15 minutes, followed by a maximum 10-minute question period. A session moderator will aid the student speaker in maintaining this schedule and in fielding questions from the audience. The procedure for maintaining the time includes a 12-minute signal for the student, and finally a 15-minute signal. At the 15-minute point, the student speaker must stop the presentation even if he or she has not finished. Following the presentation, the session moderateor will ask for audience questions. The speaker may entertain questions while the exchange appears interesting and relevant. Questions intended to harass the student speakers will not be allowed by the session moderator. The speaker should repeat a question before answering so the audience may understand the entire dialogue.

Use of Audio Visuals - Available equipment. Available audio-visual equipment in each session at National includes: (1) one 35mm slide projector with remote control; (2) one overhead projector; (3) one projection screen; and (4) a laser pointer. The use of VCR's or computers is permitted; however, the use of this equipment is restricted. (Refer to the section, VCR and Computer Usage, on page 4.) "Session Moderators" will be assigned and help student speakers with set-up of audio-visual equipment; however, equipment operators are not provided.

THE NATIONAL SYMPOSIUM - REQUIREMENTS FOR THE ORAL PRESENTATIONS

Use of Audio Visuals - Available equipment (Cont'd). If helpful, students may get help from a teacher or fellow student, especially when using overhead projectors. Students should number visuals in sequence so an assisting operator or the presenter can easily reshow one. May times, visuals are reshown during the questioning period.

Aids to the presentation. No written handouts are permitted. Research apparatus may be used if it is integral to the presentation and *only if the apparatus is hand-held.*

VCR and Computer Usage. Students who plan to use either computers or video during the presentation must...

1. *Request equipment from the National JSHS Office.* Requests must be received prior to April 1, or no later than two weeks prior to National.

2. *Computers - Coordinate specific technical requirements with National.* If computers are used, it is strongly suggested that the student, or their teacher or mentor, contact the National JSHS Office to discuss and review specific technical details (e.g. projection, set-up, etc.).

3. Comply with the following groundrules.
   a. Only VHS, 1/2" tape, format is permitted.
   b. The video component cannot make up more than two (2) minutes of the presentation.
   c. No audio or background music is permitted other than sounds that are an integral part of the research. Recorded or mechanically produced narration is not permitted. Narration must be done in person by the speaker.
   d. Computer generated graphics, videos (and audio, if any) may be used for those aspects of the research design or scheme that cannot adequately be presented by slides or overheads. Computer and video material presented must be an integral part of the research and should not be a substitute for presentation of data. Videos and computers must not be used for presentattion of common procedures, illustrating equipment or showing laboratory facilities. Videos and computers should illustrate work that was done and should not be used for stimulation or aesthetic value.
   e. The use of software such as PowerPoint may be used to prepare or to drive slides or overheads. Students must provide their own equipment and software.

THE NATIONAL SYMPOSIUM - SUGGESTIONS TO PREPARE FOR THE ORAL PRESENTATIONS

Remember, you are the expert. No one in the audience knows as much about your research investigation as you. Therefore, remember to explain your research in enough detail so the audience will understand what you did, how you did it, and what you learned.

Whenever possible, *avoid jargon* or unnecessary terminology. If it is essential to use specialized terms, remember to explain the specialized term briefly. Give your audience enough time to understand what you are trying to convey.

Graphs, tables and other representation help explain your results. Keep them simple and uncluttered. Focus on important information; for example, remember to name the variables on both axes of a graph, and state the significance of the position and shape of the graph line.

Deliver your presentation at a comfortable pace. It helps to practice your presentation before a non-specialized audience. Practice will help perfect the presentation and the timing. Do listen to the advice of your non-specialized audience but also get help from a teacher or other advisors as needed.

THE NATIONAL SYMPOSIUM - THE COMPETITION AND JUDGING

THE CATEGORIES OF COMPETITION

Student finalists must designate on the abstract both the major discipline and sub-discipline of the research. For student presenters, this designation will be used to place you in the competition. If no discipline or sub-discipline is designated, you will be placed randomly in the competition. The major disciplines and sub-disciplines include:

Earth and Space Science, including astronomy, environmental science, geology, marine science, meteorology

Physical Sciences or Technology, including chemistry, energy, engineering, and physics

Behavioral Science

Mathematics and Computer Science

Biological sciences, including biochemistry, general biology, forestry, genetics, medicine and health, microbiology and physiology

Upon receipt of all the abstracts and papers at the National JSHS Office, the schedule for the paper competition will be organized. The presentation and competition are organized to form eight sessions with approximately equal numbers of students in each session. A 1st place finalist and runner-up finalists will be selected from each of the eight sessions.

JUDGING

The National JSHS Judging Team includes individuals who hold either a Ph.D. or equivalent experience in the general fields of research that are represented by the National student presenters. Judeges are selected also for their interest in encouraging the students' interests and future development in the sciences, engineering, or mathematics.

The following criteria will be used to judge the National research presentations:

1. ***Quality of the research and experimentation as evidenced by:*** the clarity in stating the problem; identification of the important variables; originality and ingenuity in the research design or apparatus; selection of proper equipment for the research task; recognition of the limitations in the accuracy and significance of the results obtained; limitations of conclusions drawn to those which are clearly supported by the results.
2. ***Evidence of the students' understanding*** of the scientific and technical principles involved in the investigation.
3. ***Originality in the choice of and in the investigation of the topic.***
4. ***Acknowledment of major assistance.*** The student speacker must acknowledge any direct assistance received. As a researcher, the student is neither rewarded no penalized by the judges for utilizing special advisors or equipment. Examples of areas of assistance which should be acknowledged include: selecting the topic of research; planning and /or guiding the course of the research; gathering data; and construction of apparatus.
5. ***The quality of the oral and written presentations*** as evidenced by the organization of the paper; use of audio-visuals; the clarity of enunciation; the use of acceptable terms and grammer; the voice projection; the definition of terms when necessary; and the capacity to handle well the questions that are asked. The presentation is important in the evaluation of the student, but content, not form, will be given the major weight.

References, National JSHS Guidelines, revised September 1997
Blakerman, John A. "Elements of the Science Symposium," Science and Math Events: Connecting and Competing.
Wash, D.D.: National Science Teachers Association, 1990. p. 56-57.
Laursen, Gary, and Schamel, Doug. "Resource Packet and Student Guidelines for the 1997 Alaska Statewide High School Science Symposium. 1996. University of Alaska, Fairbanks.
Ragsdale, Ron. "Writing a research paper for the Intermountain JSHS." Publication date unknown. University of Utah, Salt Lake City, UT.

AWARDS

Significant awards are available to students who complete in the regional and national symposia. Many university sponsors who conduct the regional symposia contribute scholarships, cash awards, and other prizes. The availability of these additional awards, type of award, and value vary by region. The Departments of the Army, Navy, and Air Force jointly sponsor the following awards...

For students who participate in regional and national symposia...

- ***Public recongnition and certificates***, honoring achievement and interest in research pursuits
- ***Attain a sense of achievement and self-confidence*** resulting from interaction with students from other schools and regions and with professional researchers and educators. To quote a former JSHS alumnus, [At JSHS] "I learned a tremendous amount of science, got to meet other high school students who shared my interests in science, and learned that I could succeed at any program that I chose to pursue."

For 48 teachers...

- ***A $500 award*** to one teacher at each of the 48 regionals, honoring the individual teacher's and his or her school's contributions to advancing student participation in research.

For the regional finalists...

- ***An expense-paid trip to the National JSHS***, awarded to five finalists at each regional symposium. The National brings together over 360 participants in a program of educational and scientific exchange.
- ***An invitation to present their original research investigation at the National JSHS***, awarded to the 1st place finalist at each regional.
- ***A $4,000 undergraduate, tuition scholarship***, awarded to one 1st place finalist at each regional (scholarship payable upon matricultaion)

For the national finalists...

- ***Eight $16,000 undergraduate, tuition scholarships***, awarded to each of the 1st place finalists in the National research paper competition (*including the award made at the regional level, a total $20,000 scholarship, payable at $5,000 per year for 4years)*
- ***Eight $6,000 undergraduate, tuition scholarships***, awarded to each of the 2nd place finalists in the National research paper competition *(including the award made at the regional level, a total $10,000 scholarship, payable at a minimum of $4,000 per year for two years and $2,000 in year 3)*
- ***Eight $2,000 undergraduate, tuition scholarships***, awarded to each of the 3rd place finalists in the National research paper competition *(including the award made at the regional level, a total $6,000 scholarship, payable at $4,000 in year one and 2,000 in year two)*
- ***An expense-paid trip to the London International Youth Science Forum***, an exchange program bringing together over 400 participants from 60 nations. The London trip is awarded to each of the 1st place finalists; the runner-ups are alternate winners.

Hudreds of volunteers, including teachers, mentors, university faculty, representatives of the Army,
Navy, and Air Force, and others, contribute their time and talent to JSHS and
the encouragement of science among the nation's best and brightest secondary school students.

If we can be of assistance, please contact the National JSHS Office or your regional symposium representative

The National Junior Science & Humanities Symposia (JSHS) Program

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36TH NATIONAL JUNIOR SCIENCE & HUMANITIES SYMPOSIUM
JUDGES SCORE SHEET

NAMES OF STUDENT: ______________________________ **SESSION: A B C D E F G H**

I. THE STUDENT'S INVOLVEMENT WITH SCIENCE	MAXIMUM SCORE	ACTUAL SCORE
Problem and Hypothesis • Originality - Identification of problem and hypothesis • Clarity in stating problem	(10)	
Background Infomation and Prior Research Acknowledgement of sources	(10)	
Design of Investigation Extent of student's involvement in designing the procedures	(10)	
Investigative Procedures • Identification and control of variables • Laboratory skills and techniques • Selection of proper equipment • Observation/measurements/data gathering/statistical analysis • Interpretation of data; conclusions supported by data • Problem solving	(20)	
Overall • Creativity/originality • Evidence of student's understanding of the scientific or technological principles employed in investigation • Application, next steps, or future research	(20)	
	TOTAL (70)	
II. THE STUDENT'S EFFORT AND PERFORMANCE	MAXIMUM SCORE	ACTUAL SCORE
Duration of research -- Amount of work involved Acknowledgement of major assistance Evidence of student's understanding	(10)	
Presentation • Clarity in stating problem and hypothesis • Clarity in describing design, procedures, problems, and how they were handled • Clarity in presenting data, interpretations, and conclusions • Overall organization • Definition of terms as necessary • Appropriate use of audio-visuals • Clarity of enunciation and voice projection • Response to questions	(15)	
Abstract Content, format grammer, organization	(5)	
	TOTAL (30)	
III. COMMENTS		

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